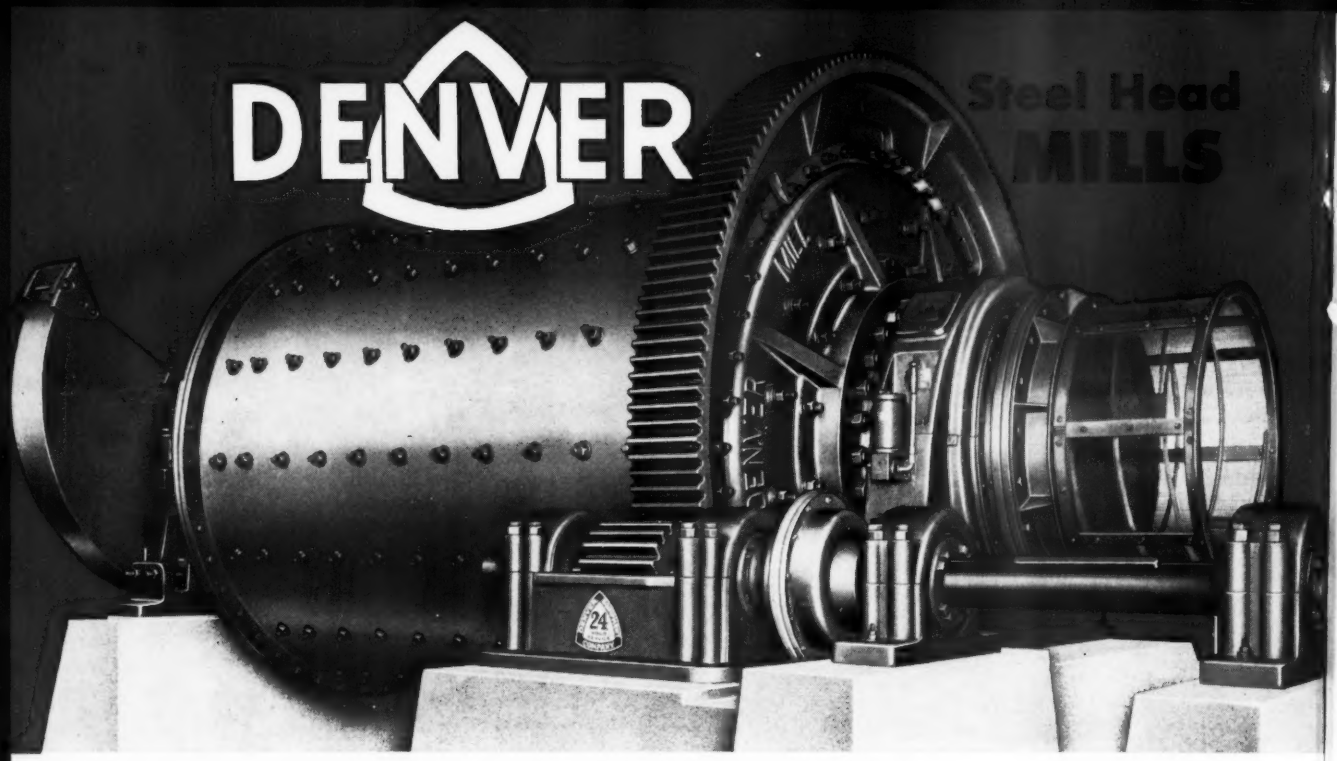
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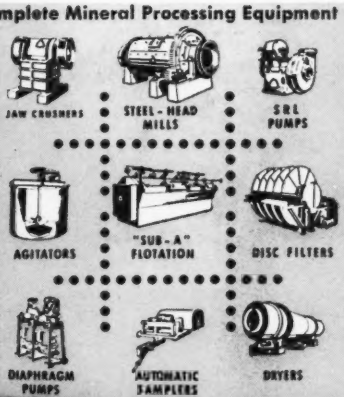
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VOL. 46 SEPTEMBER 1960 NO. 9

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Opinions expressed by the authors within these pages are their own and do not necessarily represent those of the American Mining Congress.

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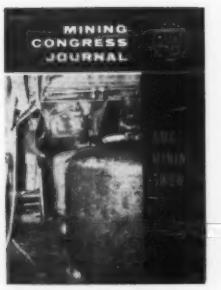
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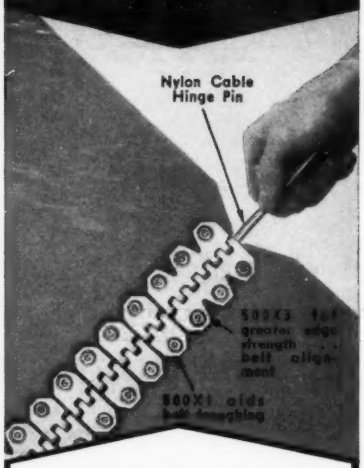
ON OUR COVER

Loading concrete from six cu yd underground remixers into a train of special containers which will deliver and place it in forms at the San Manuel mine in Arizona. For complete story see pp. 66 to 72.



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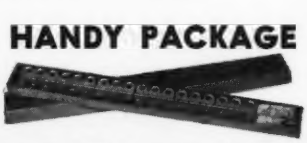
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featured IN THIS ISSUE—and the

DESIGN OF A POWER SYSTEM FOR A NEW MINE

Southern Electric Generating Co. has opened a new 1,500,000 ton-per-year coal mine in Alabama. Of particular significance is the fact that the operation is pioneering the use of a-c power for underground mine use in the State. Here is a full account of the step-by-step procedure used to develop an electrical system that is consistent with or exceeds the recent conclusions of the AMC Underground Power Committee and the recommendations of the U. S. Bureau of Mines.

THE ELECTRIC WHEEL DRIVE IN MINING

At the Berkeley Pit near Butte, Mont., a trolley-type electric truck with motorized wheels is hauling 75-ton loads up a 15 percent grade at 12 mph. Here is a full report on the Anaconda Company's new diesel-electric truck that may permit: the economical operation of deeper open pits than are now practical; the pit layout to conform more closely to the shape of the ore body, resulting in greatly reduced stripping ratios; and the reduction of haulage distances now required for waste disposal.

PLACEMENT AND USE OF CONCRETE UNDERGROUND

Concrete support of weak, heavy ground in large scale underground mining operations can show a decided economic advantage over conventional timber and steel supports by reducing maintenance costs. At San Manuel, concrete linings in raw, rock bolted or lightly supported excavations provide stronger, more permanent support while improving ventilation and safety conditions.

PROGRESS IN PREPARATION PLANT AUTOMATION

Drawing on more than 30 years of experience in the coal fields, the author presents a keen analysis of "how to produce a better product at a lower cost." Major topics covered are: automatic measurement of gravity for dense media vessels, moisture indication and possible control, automatic sampling, and automatic control of railroad cars under the loading point.

TWO-WAY RADIO COMMUNICATIONS IN THE MINING INDUSTRY

Five authors, representing major users of two-way radio in the copper, coal, iron and industrial minerals industries, combine their knowledge of what it is, how it works and how to apply it.

AUTHORS

A member of the AMC Committee on Underground Power and author of numerous technical papers on problems of the power industry, F. G. (Jack) Hamner has been with Southern Services, Inc., or its predecessors in Birmingham, Ala., since 1924, doing all kinds of engineering pertaining to public utility companies of the Southern Co. group. Upon the formation of Southern Electric Generating Co., he undertook the studies leading to the adoption of a-c- power in the two new mines this company has opened.



Edward R. Borcherdt is a partner in a worldwide mining consulting concern known as Borcherdt & Smith. Previous experience includes nearly 40 years of service with the Anaconda Co. He started its mining research department in 1923 and is credited with initiating many improvements in mining methods and equipment now used at Anaconda's widespread operations.



C. L. Pillar's mining career began in 1935 with the Park City Consolidated Mining Co. at Park City, Utah. From 1937 to 1946 he held both operating and mine engineering positions with St. Joseph Lead Co. Since 1946 he has been employed by Magma Copper Co. and is presently mine superintendent of the San Manuel mine.



R. E. Joslin, manager, preparation department, Clinchfield Coal Co., Division of The Pittston Co., started in the coal industry in 1929 with the engineering department of Rochester & Pittsburgh Coal Co., and later organized its preparation department. In 1947 he joined Pittsburgh Consolidation Coal Co. and in 1956 became associated with Clinchfield.





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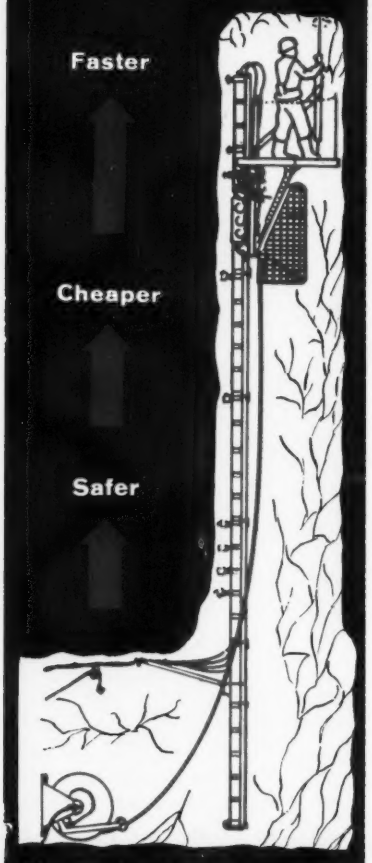
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continued

IN THIS ISSUE—and the

NEW DEVELOPMENTS IN BELT HAULAGE

Transportation has often been the forgotten link in the coal production chain—but as mining machines get larger and mining becomes more concentrated, industry is going to have to give it more attention. Harry Meador concentrates on the status of underground belt conveyor haulage, covering such significant developments as the rope-suspended intermediate structure, changes in the basic design of carrying idlers, the introduction of solid woven belting, and conveyor equipment. He also considers future trends and developments, and compares the performance of various types of conveyors in different jobs.

FOREMEN AND SUPERVISORY TRAINING

A supervisor has to know more than just his job! He is the key man in keeping up morale, maintaining discipline and motivating employes, and he has to be an expert on human relations. Training will help him to do a better job and prepare him to advance further by increasing work output and efficiency—factors taking on greater importance in the face of increasing world-wide competition.

LAND RECLAMATION—PART 1

Is compulsory reclamation necessary for the coal industry? Here is a full report on the subject that highights the effects of strip mining, apparent reclamation benefits, and practices and requirements where spoil bank reclamation is mandatory. This brief directed against compulsory reclamation concludes that most of the effects cited as due to stripping are more imaginative than real, and that the apparent benefits claimed for legislated reclamation can be and are met equally well by voluntary reclamation practices performed by coal operators and others—and by nature itself.

PREPARATION OF HIGH-PURITY METALS

The necessity of preparing many of the refractory metals in extremely pure form has forced the development of new techniques and new metallurgical concepts to effect the removal of small amounts of damaging impurities. The Bureau of Mines has been active in developing the inert-atmosphere, high-vacuum and chloride metallurgical techniques by which such metals as vanadium, thorium, zirconium, and tantalum and others are prepared in pure form.

VIEWPOINTS ON SAFETY—PART VI—ACCIDENT PREVENTION—AN AID TO PRODUCTION

While one accident may differ from another, they are all similar in one respect; every accident causes lost production. Therefore, prevention becomes an important aid to production and becomes more significant as labor costs increase. This point is emphasized by a case history in which the direct and indirect time lost amounted to about 55 man-hours in addition to the injured workman's disability.

AUTHORS—



Henry W. Meador, Jr., General Superintendent, Stonega Coke & Coal Co., has devoted most of his career to coal mining. In 1949 he went to work for Stonega as an apprentice, serving in such fields as engineering, safety, operations and shipping. He moved to Westmoreland Coal Co. at Irwin, Pa., rising to general superintendent before he returned to Stonega when Westmoreland curtailed its Pennsylvania operations.



In 1939 James P. Logan joined with representatives of about 12 industries to form the Colorado Employers Council, which in 1946 became the Mountain States Employers Council, Inc. He was the first managing director of the founding group and is currently executive vice president of the Council. He is a member of the Business Research Advisory Council to the Bureau of Labor Statistics.



In addition to being head of the Division of Mineral Economics and Coal, State Geological Survey of Kansas, University of Kansas, Dr. Walter H. Schoewe is associate professor of geology at the University and associate editor of *Transactions*, Kansas Academy of Science. His special interest in Kansas spoil banks dates back to 1944 when he started his studies on the coal resources of Kansas for the State Geological Survey.



Philip C. Good is a supervisory extractive metallurgist at the U. S. Bureau of Mines, Albany, Ore., Experiment Station. Before joining the Bureau in 1955, he was chief chemist of the Manganese Dioxide Division of Ray-O-Vac Battery Co. He is currently concerned with studies involving high activity metals such as columbium, vanadium and thorium.



R. L. Wahl, Jr., has been assistant mine superintendent at the Sunrise mine of Colorado Fuel & Iron Corp. since 1955. Before that, he was resident engineer at CF&I's Cedar City, Utah, operations from 1945 to 1955. He joined the company as a junior engineer in 1942 at Pueblo, Colo.



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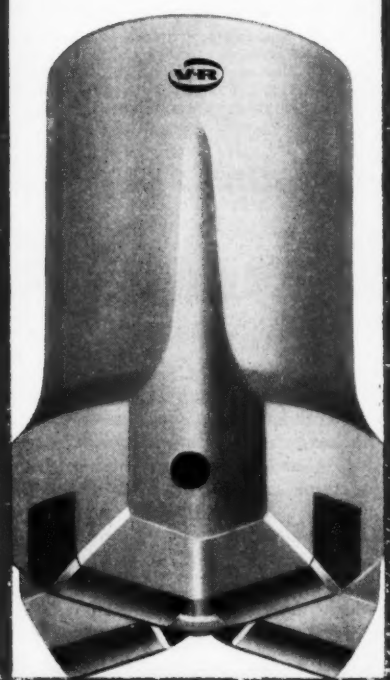
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THE 966 and 922

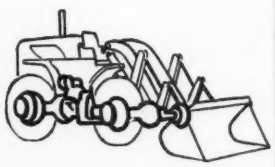
Cat's first wheel loader, the 2 yd. 944, introduced this spring, has already gained an acceptance unmatched in machinery history. Now there's a full line and one for your job: the 966, 2¾ yd., 140 HP, for high production jobs where you measure time in tons of material loaded; the new 922, an 80 HP, 1¼ yd. Traxcavator with all the safety and fast operating features of the two bigger machines. The 922 can give you speed, versatility and production to handle all those jump-and-run jobs.

Have you seen a 944 working in your area? Have you asked the owner about its dependability and favorite features? He's probably got some mighty impressive answers. And frankly it's understandable why these Traxcavators have made a name for themselves so quickly. There is a *7-year* history of thorough testing and development behind these *new* machines. They come from the manufacturer with 23 years' loader experience and 20 years of wheel tractor know-how.

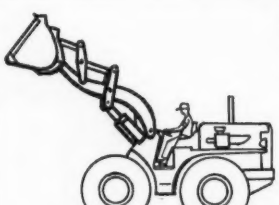
Look at the features that are on all 3 loaders: clean, open cockpit, easy to get into; bucket arms up front away from the operator; well-balanced design; long dumping reach (nearly 5' on the 966), soaring lifts to get over truck sides

ATTEND THE METAL MINING CONGRESS IN LAS VEGAS, OCTOBER 10-13. CATERPILLAR WILL SHOW THE

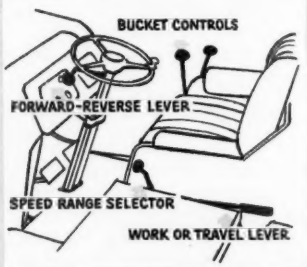
Both the 966 and the 922 have all the features proved in the field by the popular 944 Traxcavator



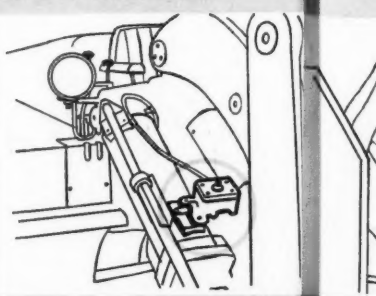
POWER SHIFT TRANSMISSION with torque converter gives smooth, instant shifting for 1st-2nd speeds—forward and reverse. In travel range, the machine is in 2-wheel drive for high-speed roading. A shift to work range automatically puts power to all 4 wheels for full traction.



OPERATOR SAFETY Lift arms and cylinders are all forward of the cockpit . . . giving complete freedom of movement. Visibility is excellent at all times. It's easy and safe to get into a Traxcavator from either side . . . up 3 wide steps . . . no ladders to climb. Tires are covered by fenders.



OPERATOR CONVENIENCE Bucket controls are on the right side, leaving the left hand free for machine operation. The forward-reverse lever is mounted on the steering column for finger-tip shifting without decelerating, steering is power boosted with dual-ratio on the 966.



AUTOMATIC BUCKET KICK-OUT DEVICE allows faster cycles. After loading bucket, pull lift lever to up position. Bucket goes up to dumping height and control kicks into hold position automatically. While lowering bucket after dumping, set tilt lever, and bucket is positioned for digging.



922 TRAXCAVATOR—1¼ CU. YD. STANDARD BUCKET • 80 HP. Your choice of compact 4-cylinder Caterpillar turbocharged Diesel Engine (uses low-cost furnace oil without fouling) or 6-cylinder gas engine with large cubic inch displacement for long life and sustained power. Use the type of engine that matches your other equipment. With either engine you have one source of warranty responsibility . . . one source of parts and service . . . your reliable Caterpillar Dealer. • Long 40¾" reach at 7' dumping height . . . maximum lift of 11' 2". • For top production in its class, the new 922 Traxcavator has all the safe, fast operating features of the bigger machines.

TO ITS WHEEL LOADER LINE...

TRAXCAVATORS

and railroad cars; automatic bucket controls to speed cycles; dependable Cat Diesel power with optional gasoline engines on two smaller models; Cat power shift transmission to change speed and direction with a finger touch, without decelerating; and service features like the dry-type air cleaner and unitized construction.

There's one man in your area with all the facts — your Caterpillar Dealer. Get in touch with him now. Ask for a demonstration — once you watch one of these machines you'll want it!

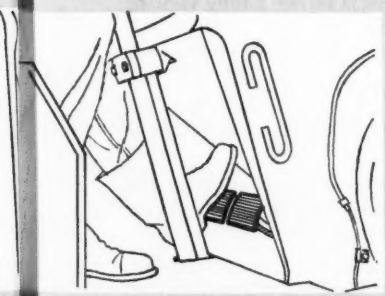
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CATERPILLAR

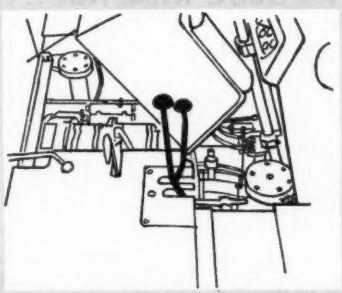
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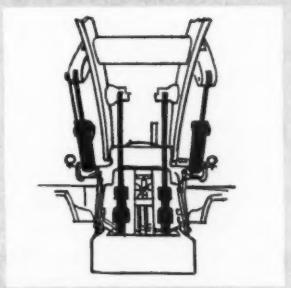
966 TRAXCAVATOR IN THE MAIN EXHIBIT HALL



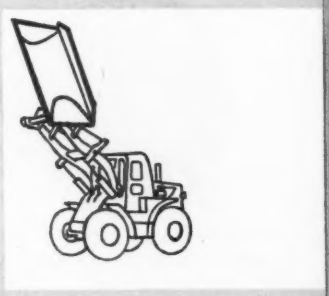
DUAL BRAKES The left brake pedal neutralizes the transmission as it stops the machine. This transfers extra power to the bucket . . . assuring full loads even in tough material. The right brake pedal stops the machine with the transmission engaged . . . giving full control for roading downhill.



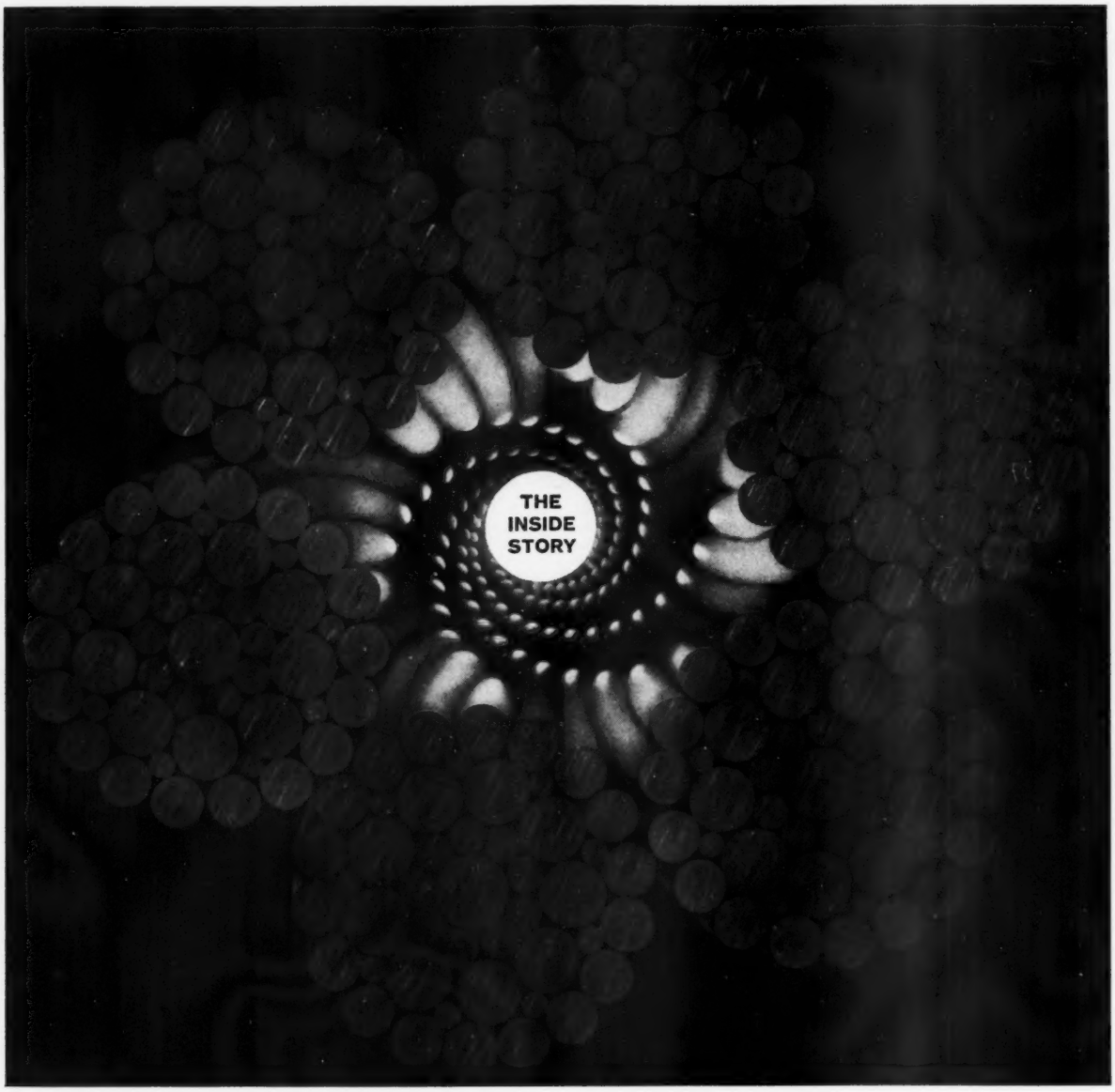
EASY SERVICE ACCESS The seat tips forward for quick access to transmission oil filter and control linkage adjustments. Unit construction allows independent removal of engine, transmission, other major components. The dry-type air cleaner can be serviced in about 5 minutes.

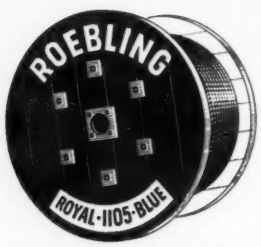


LIVE-ACTION HYDRAULIC SYSTEM Plenty of power from the engine is always available to the husky vane-type pump that supplies the pressure and volume for fast bucket action. Control valves are enclosed in the steel reservoir for complete protection. System is full-flow filtered.



AVAILABLE WITH A COMPLETE LINE OF ATTACHMENTS, including special buckets for light or heavy materials, lift forks for lumber and palletized materials, and the exclusive side dump bucket. A fiber-glass cab is also available.





ROYAL BLUE—*we put a lot of work into it—You get a lot of work out of it.*

ROEBLING ROYAL BLUE WIRE ROPE This is rather a long view of a wire rope that's a real work horse. Time and tests have taught us at Roebling that wire rope users *want* the long view. What else, they say, are they spending their money for?

Here, you're looking through a length of Royal Blue whose core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

This is one of the reasons why Royal Blue lives up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

We have to know that the rope we build will do what we sell it to do. Numerous quality-control measures help us—as they do you—to take the long view of Royal Blue. For details about long-lasting Roebling Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation



with CYANAMID EXPLOSIVES!

The less it costs to blast and load a ton of ore . . . the more money you make. It's that simple . . . and that difficult.

Cyanamid helps you reduce your cost per ton of ore mined, with a complete line of high quality explosives, exclusively designed to give economical breakage.

Whether your ore is pure or disseminated, in thick deposits or thin veins, whatever the pitch of your vein or the nature of your ore body, there's a Cyanamid explosive that will break ore loose in a form convenient for handling.

When you call on Cyanamid, you also profit from the valuable technical assistance of our experienced explosives engineers. Prompt delivery from a nation-wide network of plants and magazines keeps production moving.

For information on Cyanamid's complete line of explosives and blasting accessories, phone or write our nearest office.

CYANAMID

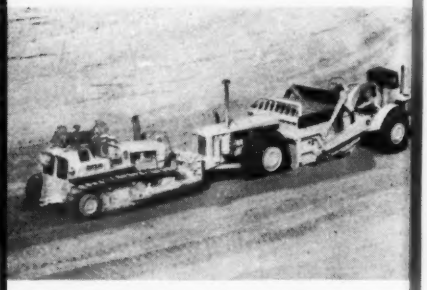
AMERICAN CYANAMID COMPANY
EXPLOSIVES AND MINING CHEMICALS DEPARTMENT
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

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New York, N.Y. • Tulsa, Oklahoma • Latrobe, Pennsylvania • Pottsville, Pennsylvania • Dallas, Texas • Salt Lake City, Utah • Bluefield, West Virginia
PLANTS: Latrobe, Pennsylvania • New Castle, Pennsylvania • Springville, Utah
PRODUCTS: High Explosives • Permissibles • Seismograph Explosives • Blasting Agents • Blasting Caps • Electric Blasting Caps • Blasting Accessories





At a coal stripping operation in Pennsylvania, this TC-12 removes overburden at a rate of 400 to 500 yds. per hour. It is equipped with 16' blade...works two 8 hr. shifts a day.



Euclid Twin-Power teams — TC-12 Crawlers and TS-24 Scrapers — move over a million yds. a month at this Wyoming open pit uranium operation.



Model C-6 crawler back-filling overburden in the pit . . . full-power shift, good visibility and fast response make this "Euc" a high production machine for mine and quarry work.

Work-ability of "EUC" Crawlers Steps Up Production on Tough Stripping Jobs

Euclid's modern crawlers—the 211 net h.p. Model C-6 and the Twin-Power Model TC-12 with 425 total net h.p.—have set new standards of tractor production in mine and quarry work. With performance proved Torqmatic Drive, both of these crawlers have excellent maneuverability and fast response that cuts work cycle time. They're engineered for easy service accessibility that results in less downtime and lost production.

Have your dealer give you all the facts on these "Euc" tractors...he'll show you the features that pay off in better production on every stripping job, whether it's heavy dozing or ripping work, push loading big scrapers, or moving coal, ore and other materials.

EUCLID Division of General Motors
Cleveland 17, Ohio

Plants at Cleveland and Hudson, Ohio, and Lanarkshire, Scotland.

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

for action, economy and compact operation



the CMI model 26 CONTINUOUS CENTRIFUGAL DRYER

This compact CMI Dryer was designed and built to fit jobs of moderate proportion (up to 20 tph) . . . whether to dry coal or minerals to less than 5% surface moisture . . . to keep coal or minerals from freezing . . . or to recover coal or minerals from slurry ponds.

Model 26 is the ideal centrifuge where space or head room is limited, where production is less than 20 tph and where trouble and down-time free, economical and continuous operation are desired.

The CMI Model 26 is the smallest and most compact centrifugal dryer in the CMI line of dryers in operation in hundreds of installations in leading industries throughout the world.

FOR COMPLETE DETAILS ABOUT THE CMI MODEL 26, WRITE OR WIRE.

CENTRIFUGAL AND MECHANICAL INDUSTRIES CMI

146 President Street • St. Louis 18, Missouri

Thor

Everything you want in Push Feed Drills . . .

and more!

Thor's new model 330 push feed rock drill outperforms every other drill in its class . . . a fast, rugged, perfectly balanced drill with convenient controls. Two new feed legs have been engineered for use with the Thor model 330.

Model 333 is a power retracted feed leg, single stage, which extends 51" in operation. Feed rod extends from bottom of cylinder.

Model 335 is a telescopic, manually retracted leg which extends 73" in operation. Feed rod extends from the top of the cylinder.

Either leg is easily attached to the drill by a single nut.

Throttle valve controls the air and water supply to drill and feed leg. Ask your Thor "Red Tool" distributor or Thor service branch to demonstrate. Thor Power Tool Co., Aurora, Ill. Branches in all principal cities.



Thor POWER TOOLS

See the new Model 330 at Thor Booth No. 322, American Mining Congress Show, October 10-13, Las Vegas

NEW!



STANDARD Coal Spray Oils to give you these 5 Big Benefits

1. Four viscosity grades. There's an oil of the right viscosity for (1) the kind of coal you mine, (2) your application needs.

Grade	Saybolt Universal Viscosity at 100° F
Coal Spray Oil No. 60	600
Coal Spray Oil No. 100	1,000
Coal Spray Oil No. 150	1,500
Coal Spray Oil No. 300	3,000

2. Hot delivery from Wood River, Ill. Anywhere within 200 miles of Wood River, Illinois, you can get truck transport quantities of STANDARD Coal Spray Oils delivered at high temperature. This means easier transfer, less heating to get to application temperature.

3. Good application qualities. STANDARD Coal Spray Oils can be applied easily by either the hot vapor spray or high pressure atomized cold spray methods. The oil adheres to coal and effectively binds particles that would otherwise dust.

4. Non-corrosive to coal handling equipment. No costly wearing out of handling equipment occurs when you use STANDARD Coal Spray Oils. There's no down time for repair and replacement of equipment.

5. Three valuable product benefits. (1) A clean, dustless product to sell. (2) A good, bright appearance to your coal after spraying. (3) Reduced windage losses in shipment.

For freeze-proofing coal, get Standard's WR 663½ Oil.

Get all the facts about STANDARD Coal Spray Oils and freeze-proofing oil from the Standard Oil office nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from STANDARD *and you get it!*


P&H
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1800



IF PURCHASES ARE ENDORSEMENTS...

P&H is the no. 1 choice in copper mining

Every electric shovel bought for the Southwest by copper companies in the past year has been P&H

Typical of P&H acceptance in copper mining, today you will find *three* or *more* P&H Electric Shovels working at each of 8 out of Arizona's 9 operating copper mines.

P&H has earned such widespread acceptance in the copper mining industry because of lower per-ton loading cost. This profit premium to owners of P&H Electrics results from two basic advantages.

1. Higher rate of production made possible by exclusive, patented P&H design principles: MAGNETORQUE® Hoist Drive and Electronic Control.

2. Vastly superior service and parts availability reflecting our partnership of responsibility to you, the buyers of our products.

Your satisfaction with these advantages has made us the *World's Largest Builder of Full-electric Shovels.*

HARNISCHFEGER P&H
Milwaukee 46, Wisconsin

Please Come See Us—AMC Show In Las Vegas—P&H Booth 503



consistently

UNIFORM

grinding efficiency

It's something you can depend on with Moly-Cop Balls. Their performance never varies because Sheffield alloying, forging and heat treating are kept invariable by Sheffield quality control. They keep their spherical shape longer because their uniformity of fine grain structure goes right to the core. That means a better grinding job, and greater economy.



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Grinding Balls

The Standard
of Comparison
Around the World

SHEFFIELD DIVISION

Sheffield Plants in Kansas City, Tulsa and Houston

ARMCO STEEL CORPORATION

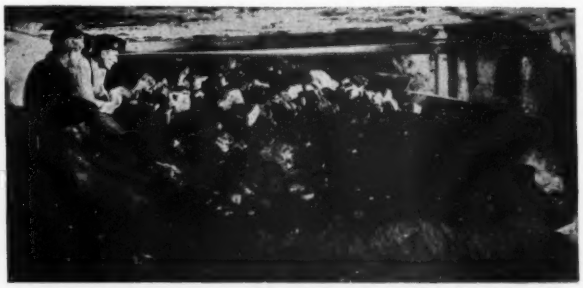
OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

"RATIO-FEEDER* saves us 20 seconds in the unloading of each shuttle car...

we have found your Ratio-Feeder to be a very valuable piece of machinery in our Thunderbird Mine," says WILBUR A. ENDICOTT, General Superintendent, Ayrshire Collieries Corp.



1. Shuttle car unloads at its maximum discharge rate into a Ratio-Feeder in Ayrshire's Thunderbird Mine. The 20 seconds saved increases mine output...extends shuttle car haul distance...lowers cost per ton.



2. "The wide intake conveyor of the Ratio-Feeder takes the full load of the shuttle car with a minimum of spillage and holds down clean up costs," General Superintendent Endicott reports.

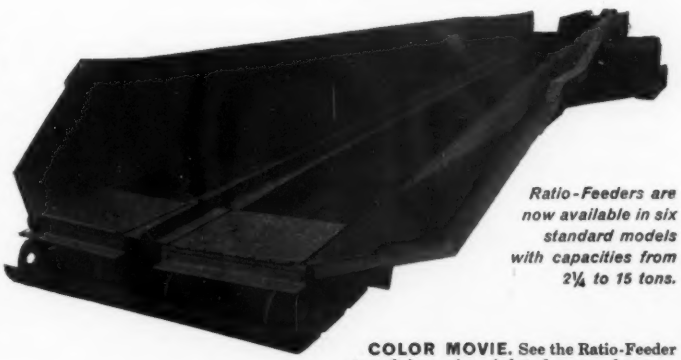


3. Ratio-Feeder discharges at a uniform rate reducing belt overloading, damage and wear. "It can be set to proportion the coal so that several panels can unload onto the same belt without stopping any one of the others," says Mr. Endicott.



4. Ready for the next shuttle car. This Ratio-Feeder was installed in September 1959, had handled 250,000 tons of coal when picture was taken 6 months later. Two more Ratio-Feeders have since been installed in the Thunderbird Mine.

The Ratio-Feeder is now demonstrating in mine after mine that it is the answer to the age-old problem of getting coal from a shuttle car to a belt...*fast*...without damage to the belt...increasing belt haulage capacity...and with a minimum of spillage. The advantages that Ayrshire Collieries and other well-known mines are getting from the Ratio-Feeder can be yours too. It will cost you nothing at all to get the complete *proved* facts as to where this time-saving machine is working and what it is accomplishing...and what it can do for you. Simply write or call us.



Ratio-Feeders are now available in six standard models with capacities from 2¼ to 15 tons.

COLOR MOVIE. See the Ratio-Feeder at work in a mine. Ask to have us show you this film at your office.

send for bulletin



CM. MINE EQUIPMENT

COLUMBUS McKINNON CHAIN CORPORATION

Mining Equipment Division

54 FREMONT AVENUE, TONAWANDA, NEW YORK

Manufacturers of **CM HOISTS, CHAIN AND CONVEYORS**

*Trademark Pat. Pend.

MATERIALS HANDLING EQUIPMENT SPECIALISTS FOR 75 YEARS

KRUPP

Bucket Wheel Excavator

At the 1960 Mining Show, Las Vegas, in Spaces No. 45, 72, 74, and 76 in the Outside Exhibit Area,
FRIED. KRUPP MASCHINEN- UND STAHLBAU RHEINHAUSEN will show a small bucket wheel excavator, Type Sch Rs $\frac{100}{0.4}$ x 9.5, having a capacity of up to 470 cu. yds. of loose material per hour.
Bucket wheel excavators are continuous duty equipment assuring a steady flow of excavated material.



The digging tool is a wheel which, in the present model, has seven buckets attached to its circumference. Each bucket has a capacity of 3.5 cu. ft.
The bucket wheel does only the actual digging, excavated material is moved to the loading point by conveyor.
A switch gear permits the choice of two speeds for bucket wheel rotation.
The bucket wheel boom and loading boom can be slewed independently. Bucket wheel boom is raised or lowered hydraulically.
This type of excavator, with the rotating wheel slewable in generally horizontal plane, is suited especially well for digging of stratified materials. Whereas bucket wheel excavators were first used mainly in open cast mines for mining and digging of overburden and minerals, they can now be seen already on the most various excavation sites, working on removal of elevations, digging cuts, canals, or basic layouts for roads and railroads.

The excavator shown here can cut in a width of 47 feet per block, at a cutting height of 31 feet. The excavator is fully electrified. It travels on two crawlers, at a speed of 20 feet per minute. Altogether, nine drive motors are installed, with a total power rating of 138 kW.
Versatility in operation and low operating cost are the predominant characteristics of this excavator.
KRUPP excavators and bulk handling plant are working all over the world, under the most severe climatic conditions — in Canada and South Africa, in the United States, Australia, India, Indonesia, in the Congo and Morocco, in Greece and Yugoslavia, Italy, France, England, Ireland, Poland, Russia and Germany.

Bucket Wheel Excavator, Sch Rs $\frac{100}{0.4}$ x 9.5, digging a cut

Bucket wheel is equipped with seven buckets. A switch gear permits the choice of two speeds for wheel rotation.

Crawler track assembly for bucket wheel excavator. Each crawler driven separately.







We advise

on all projects involving mining of materials and their transportation. We design complete surface and underground mining systems and the necessary mechanical equipment based on the broad experience of our mining, excavation and conveyor engineers.

We design,

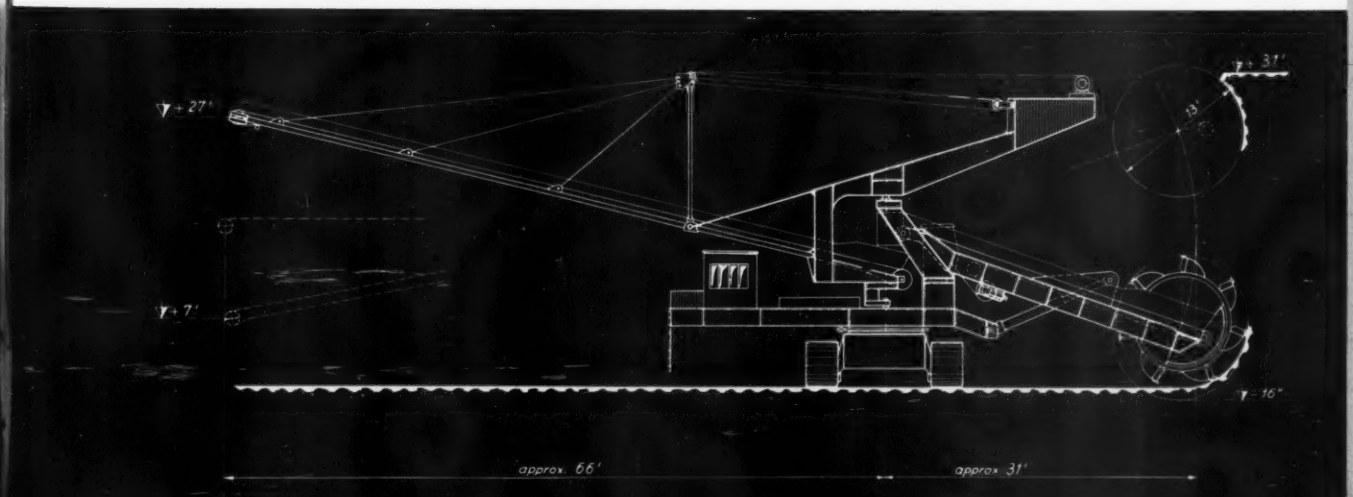
manufacture and erect excavators, either rail or crawler mounted, for mining, canal and dam construction, etc., such as bucket chain excavators, bucket wheel excavators, loaders, spreaders, stackers, special equipment, complete bunkering plants, conveyor bridges, stationary and movable conveyors.

KRUPP Bucket Wheel Excavator Type Sch Rs $\frac{100}{0.4} \times 9.5$
for a theoretical capacity up to 470 cu.yds/hr. Excavator is fully electrified. Bucket wheel boom and loading boom slewable independently.

Come and see this bucket wheel at the 1960 Mining Show, held by the American Mining Congress at Las Vegas, Nevada, October 10—13, 1960, in Spaces No. 45, 72, 74, and 76 of the Outside Exhibit Area.

FRIED. KRUPP MASCHINEN- UND STAHLBAU RHEINHAUSEN · GERMANY

For information, please contact Krupp International Inc., 375 Park Avenue, New York 22 N.Y.



1956!

EXTRA MINING CONGRESS CONVENTION

KW-DART SHOWS 35SL



KW-DART Truck Co., Kansas City, Mo., steals the show with the first single axle, 35 ton, rear end dump truck. Powered by a 400 H.P. engine, 3-stage converter and 3-speed transmission, this new KW-DART promises to be a revolutionary step forward in mining and construction operations. It's rugged with KW-DART'S 110,000 pound planetary drive axle and 50,000 pound tubular front axle. Gross vehicle weight is 131,600 pounds. Superintendents enthusiastic!

1958!

EXTRA MINING CONGRESS CONVENTION

KW-DART DOES IT AGAIN!



This year KW-DART shows the new model 50T—a sensational new 50 ton, 600 H.P. truck with tandem rear planetary axles of 100,000 lb. capacity each. This truck will provide power for the climb and speed for the haul road with 3-stage converter and 4-speed transmission and 50,000 pound capacity front axle. Gross vehicle weight is 183,000 pounds.

What will KW-DART show at the Mining Congress Convention in 1960?

EXTRA MINING CONGRESS CONVENTION

ANOTHER FIRST FOR KW-DART!

As in past years, KW-DART is introducing a revolutionary new haulage concept in the mining industry. The new KW-DART being shown is a new design, single axle with more H.P. than ever used before. Utilizing a tractor [illegible] combination, it has the biggest payload capacity —carrying [illegible] tons payload capacity.



KW-DART is introducing [illegible] new design, single axle, [illegible] than ever before. [illegible] tractor [illegible] combination, it has the biggest payload capacity —carrying [illegible] tons payload capacity.

[illegible] KW-DART Truck Co., Kansas City, Mo., steals the show with the first single axle, 35 ton, rear end dump truck. [illegible]

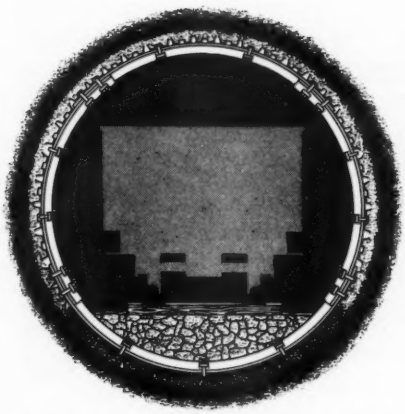
KW-DART® TRUCK CO.

1301 North Manchester Trafficway
Kansas City 41, Missouri, U.S.A.

WHEN PRESSURES SQUEEZE FROM ALL DIRECTIONS



...install Bethlehem Yieldable Rings



Lagging should completely surround the Yieldable Ring set. Poles, planks, steel ties make good lagging.

If your mine opening has a heaving bottom, or is subject to squeezing pressures from all directions, the Bethlehem Yieldable Ring offers the best means of control. The Ring is a four-piece yieldable set with four joints instead of the usual two found on the Yieldable Arch.

Essentially, the Yieldable Ring is similar to the Yieldable Arch. It is made of the same nestable U-shaped sections, works on the same sliding-joint principle, and is available for the same range of mine openings—from 6 to 20 ft in diameter.

Installation of the Ring set differs from the Arch in that the two joints at the bottom of the ring should be tightened to about 150-ft-lb, instead of the 180-ft-lb torque normally applied. This is due to the fact that the bottom two joints usually will lie in muck, which adds measurably to the friction in the joint.

One more important point: with the Yieldable Ring, as with the Yieldable Arch, lagging and packing are necessary to fill the voids between steel and rock. Lagging should *completely surround* the Yieldable Ring, as shown in the sketch.

Bethlehem engineers will be glad to visit your workings to determine how the Yieldable Ring or Arch might improve your roof control. For action, just get in touch with the nearest Bethlehem office.

Steel

For strength
. . . economy
. . . versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

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GIANT SALE!

CONSTRUCTION EQUIPMENT FROM MAMMOTH TRINITY DAM PROJECT

CALIFORNIA

(FOR DELIVERY LATE SEPTEMBER)

Liquidating $14,000,000.00 worth of well-maintained, top name equipment at BARGAIN PRICES!



CONVEYOR SYSTEM

2 miles long, 42" wide rubber belt. 9 flights, available individually, ranging from 672 ft. long to 1885 ft. long. Braking by electric motors acting as generators under belt load; also mechanical brakes. System includes drive-over hopper loading station for scraper discharge, screening and crushing plant, three drive-under terminal bins with total capacity of 1500 cu. yds.



SHOVELS AND CRANES

2—Model 150B Bucyrus Erie 6 cu. yd. Electric Shovels and Draglines (Note: 8 cu. yd. Dippers w/handles available for above); 1—Model 120B Bucyrus Erie 5 cu. yd. Electric Shovel and Dragline; 1—Model 38B Bucyrus Erie 1½ cu. yd. Shovel, Dragline, Backhoe, diesel; 1—Model 22B Bucyrus Erie ¾ cu. yd. Shovel, Dragline, Backhoe, diesel.



MOTOR PATROLS

9—Model 12 Caterpillar Motor Patrols, 8T, 80D, 70, and 71D Series.



HAULING UNITS

8—Model LRVX Mack Tractors w/Model 137W Euclid 30 cu. yd. Bottom Dump Trailers powered by NVH-12-B1 Cummins Engines; 10—Model PH95AC International Payhauler Tractors w/Model PW20 30 cu. yd. Athey Bottom Dump Trailers.



END DUMP EUCLIDS

5—Model 46TD Euclid End Dump Units, 15 cu. yd., powered by Model NHRBIS Cummins Engines; 10—Model 63TD Euclid End Dump Units, 15 cu. yd., powered by Model 6-110 GMC Engines.

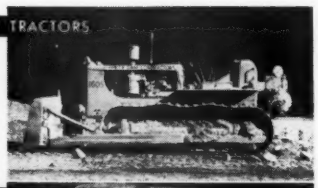


LOADERS

1—Model 175ADS Michigan 3 cu. yd. loader powered by Model 135DKBS Waukesha Engine; 1—Model D4 Caterpillar Loader w/Model EA4 Trackson Loader.

CRAWLER TRACTORS

15—Model D9 Caterpillar Tractors w/P.C.U.'s and Dozers, 18A Series (Note: 4—Ateco Hydraulic Rippers available for above); 21—Model D8 Caterpillar Tractors w/P.C.U.'s and Dozers, 14A Series (Note: 6—Caterpillar #8 Hydraulic Rippers available for above).



RUBBER TIRED TRACTORS

30—Model DW20 Caterpillar Tractors w/Model 456P Modified Scrapers, 67C and 88E Series; 10—Model DW20 Caterpillar Tractors w/Model PW20 Athey Wagons, 88E Series; 2—Model 33LDT Euclid Tractors w/Model 32SH Scrapers.



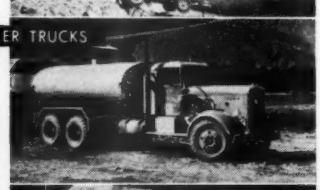
QUARRY DRILLS

1—Model TWM2A Joy Quarry Drill w/T500 Drills, pneu. tires; 3—Model TWM-5 Joy Quarry Drills w/T500 Drills, pneu. tires.



SPRINKLER TRUCKS

1—3400 gal. Model CF523C6 Kenworth powered by Model NRT6B1 Cummins Engine; 1—3400 gal. Model R1F402 International powered by Model NHB Cummins Engine; 1—3600 gal. Model RDF192A International powered by Model JBS600 Cummins Engine; 2—6000 gal. Model 46TD Euclid powered by Model NHRBIS Cummins Engine.



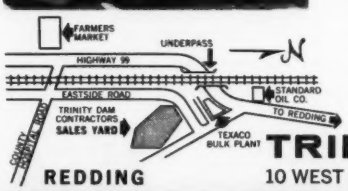
DUMPCRETE

5—4 yd. Dumpcretes mounted on International truck.



ALSO:

AIR COMPRESSORS • PUMPCRETE MACHINES • BATTERY LOCOMOTIVES • TRUCKS • PICKUPS AND JEEPS • WELDERS • LIGHT PLANTS • HOUSE TRAILERS • PUMPS • AIR TOOLS • ELECTRIC TOOLS • HOSE • PIPE • TANKS AND OTHER EQUIPMENT



All equipment kept in peak condition by elaborate preventive maintenance program. Choose from vast inventory while selection is complete. WRITE, WIRE OR PHONE FOR SALE PRICES OR TO ARRANGE A VISIT TO SALES YARD!

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The only basic design changes in feeders in the past generation.

Learn the benefits of Modern Design . . .

Engineering Catalog 60-A (just released) tells the complete NICO Conveying story. Photos, detailed drawings, diagrams, together with engineering data and specifications make it an invaluable reference in determining the right feeder or conveyor. Ask your NICO representative or write direct for your copy.



NATIONAL IRON COMPANY

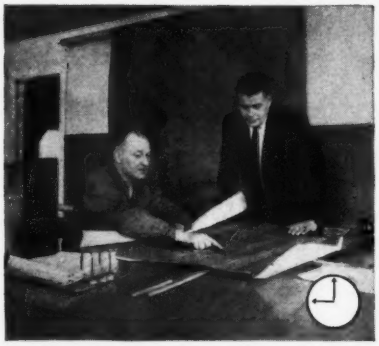
Subsidiary of Pettibone Mulliken Corp., Chicago 51, Illinois

50th Avenue West and Ramsey Street — Duluth 7, Minnesota

A Typical Day with a Hercules Representative



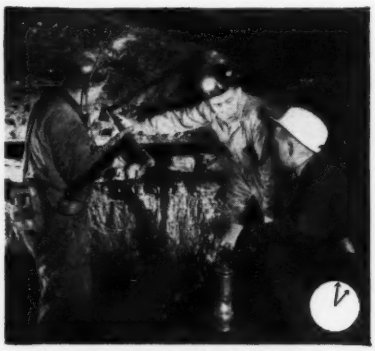
AN EARLY START enables Bob Shiel, Hercules technical serviceman, to observe step-by-step blasting procedures at his customer's mine.



CLOSE CONTACT between Bob and the mine superintendent eliminates most blasting troubles, and increases the operating economy of the mine.



UNDERGROUND with the tools of the trade, Bob examines some of the cars of blasted material to determine the effectiveness of the explosive charges.



BLASTING-PROCEDURE observation is a part of Bob's work. It takes the guesswork out of his job, and enables him to specify the proper explosives.



SHOP TALK helps find out if the remedy he's suggested has cured this mine's troubles. Bob's background gives him the insight necessary to make intelligent recommendations.



CHECKING and rechecking all the recommendations he has made gives Bob the satisfaction of knowing that he has been of assistance in solving his customer's blasting troubles.

Around the nation — around the clock

THERE'S ALWAYS A HERCULES MAN READY TO HELP YOU

Bob Shiel, E.M., Ohio State, is just one of the many specially trained Hercules men serving the explosives-consuming industries. For years Hercules has employed men with engineering training to sell and service its explosives throughout the United States and in many foreign lands. Our experience has proved that men with engineering training can meet their customers on common ground. They speak the same language, for most of the men who direct explosives-consuming work are technically trained.

When a young engineer starts his training as an explosives sales engineer with Hercules, he begins a period of orientation. He is then sent to our explosives plants and laboratories for thorough groundwork in products and processes. Upon completion of this indoctrination, he visits various sections of the country where he learns how explosives are used in underground and open-pit mines, rock quarries, heavy-construction jobs, and seismic exploration.

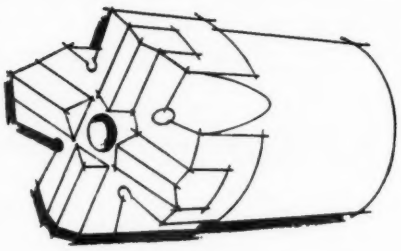
The cornerstone of Hercules Explosives Department is based on men who have the know-how to handle blasting problems quickly, efficiently, economically. To take advantage of this specialized service, call or write.

HERCULES

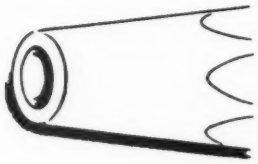
Explosives Department
HERCULES POWDER COMPANY
INCORPORATED
Hercules Tower
910 Market Street
Wilmington 99, Delaware

XR-60-2

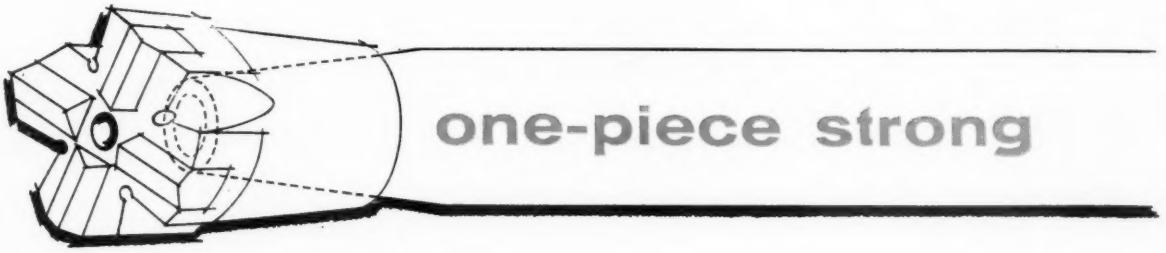
BIRMINGHAM, ALABAMA • CHICAGO, ILLINOIS • DULUTH, MINNESOTA • JOPLIN, MISSOURI • LOS ANGELES, CALIFORNIA • NEW YORK, NEW YORK
PITTSBURGH, PENNSYLVANIA • SALT LAKE CITY, UTAH • SAN FRANCISCO, CALIFORNIA



Removable



yet



That's why the Timken® air-leg bit cuts your drilling costs these 4 ways

1. You don't have to throw away good drill steels when the carbides wear out, the way you do with intrasets. The Timken bit is removable!

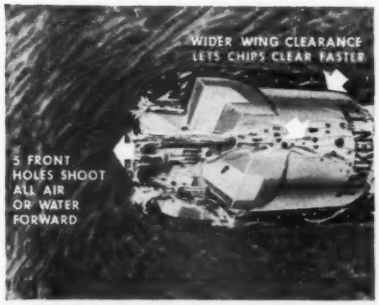
2. You don't have to haul an armful of steel to the mine the way you do with intrasets. A pocketful of Timken removable bits is enough for a whole day's work.

3. You can change bit gauge sizes fast on the same steel with a Timken bit for air-legs. Using intrasets you have to change the whole steel.

4. You carry only the bit to the shop for resharpening—when it's a Timken removable bit. With intrasets you "fight" the whole steel and Timken bits give longer gauge wear because there are *four* carbide cutting edges. Most intrasets have only two.

Get all these savings in an air-leg bit that's *tapered* for one-piece strength. And get faster chip clearance, too (see diagram at right).

Specify the Timken tapered socket carbide insert bit for air-leg drills. For free brochure write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.*



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

Call on us at the AMC Metal Mining Show, Las Vegas Convention Center, October 10-13, Booth 318.

TIMKEN®

removable rock bits

"We need the latest, most efficient hauling equipment available . . . we believe that with Haulpak, we have it," says Daniel B. Rengier of J. Robert Bazley, Inc.



"The LeTourneau-Westinghouse 32-ton Haulpak® is the best truck available to handle the hauling of overburden in our strip-mining operations," says Mr. Daniel B. Rengier, Secretary and Purchasing Agent of J. Robert Bazley, Inc., Port Carbon, Pennsylvania, contracting firm. "We need trucks large and rugged enough to handle the big loads of our 8-yd. shovels — yet the trucks have to be fast and maneuverable enough to do it *economically. Haulpaks are the answer!*



Gives us several extra truck-loads per day

"In order to strip overburden efficiently, the eight-yard shovels must be kept in continuous operation, never held up by trucks that are too small or too slow.

"We estimate that the small turning radius of the Haulpak *gains us several truck loads* in the course of a day by shortening turning time on each trip by as little as 30 seconds. Another time saver is the powerful 375-hp engine. It enables Haulpak to come out of the pit in a higher gear and at a faster rate of speed than any unit we are familiar with. Those pit inclines may be as great as eight per cent.

"Fast turn-around, plus high hauling speeds, mean that each truck can gain *one complete round trip in every seven* — of course we are speaking of trips of average length. Ours vary from 800 to 2500 feet.



Hydrair* suspension another money saver

"Further savings result from Haulpak's Hydrair suspension system. By leveling the load, it greatly reduces spillage . . . which also cuts road maintenance. In addition, Hydrair increases the life of the tires by distributing the weight of the load *more evenly* over all six tires. Loads on conventional leaf suspension tend to tip and put the weight on only one side of the truck.



Daily average: 2150 yds per unit

"We estimate that five 32-ton Haulpaks can do the work of seven 22-ton trucks like those we have in our fleet, thereby reducing labor costs as well. According to our records, one Haulpak carries a daily average of 2150 yards of overburden in 14 hours — *thanks to its speed, maneuverability, capacity and power.*



Saw Haulpaks in action

"We chose Haulpak after a trip by three officials of our company, including myself, to an iron ore mine in Utah to see these units in operation," Mr. Rengier continues. "We were impressed with everything we saw, particularly *the low center of gravity, the very small turning radius and the Hydrair suspension system.*

"The truck's driver demonstrated the effectiveness of this suspension system by rapidly turning the steering wheel from left to right while traveling 24 miles per hour. Ordinarily this type of treatment will start the rear of the truck swinging back and forth, but the Haulpak remained completely stable.

"To bid successfully on contracts for strip mining, we need the latest, most efficient equipment available, and we believe that with Haulpak, *we have it!*"

We will give you complete information on LW Haulpak — the first all-new truck in a quarter century. Available in 22, 27, and 32-ton sizes. Ask to see our color film, "Revolution on Wheels". You'll see how and why Haulpak moves more tonnage at big savings.

J. Robert Bazley, Inc., works as many as 200 trucks on its road-building and strip-mine operations, and employs up to 800 men. Its president and founder, J. Robert Bazley, has served as American Consultant to the National Coal Board of Great Britain, to design most of Britain's present day open pit mines. Mr. Bazley's grandfather, Nathan Cuyle, designed and patented one of the first power shovels used in open pit mining. The Haulpaks illustrated here are in use at the Pine Forest stripping operation owned by the Reading Anthracite Company and located near St. Clair, Pennsylvania. J. Robert Bazley, Inc., has run the stripping of this coal mine for about 30 years. This is one of three strip mines it works under contract.

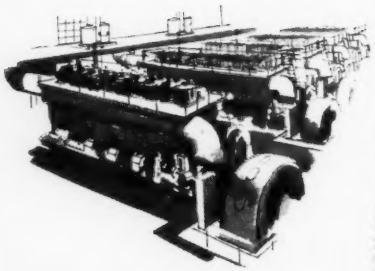
*Trademark HP-2308-DCMJ-2

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

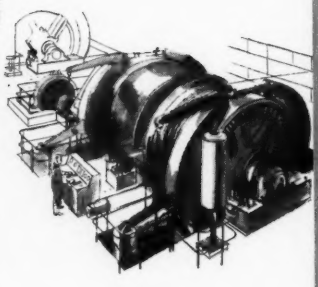
Where quality is a habit

NORDBERG MINING MACHINERY



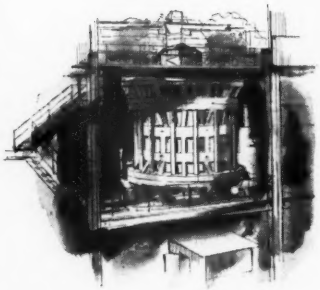
FOR POWER GENERATION

Nordberg engines are built in sizes from small 10 horsepower units to over 12,000 horsepower . . . and are available for Diesel, Duafuel® and Spark-Ignition Gas operation.



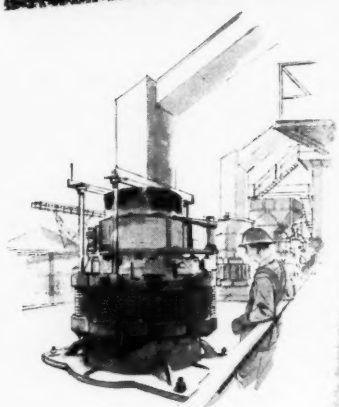
FOR HOISTING

Nordberg has an established reputation second to none, and can furnish both conventional and friction type mine hoists for men and material, to meet specific requirements.



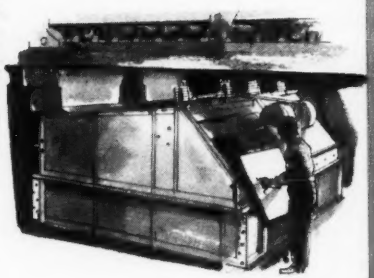
FOR PRIMARY CRUSHING

Symons® Primary Gyratory Crushers are built for big tonnage, heavy duty primary breaking in 30″, 42″, 48″, 54″, 60″, and 72″ feed opening sizes. Capacities to 3500 or more tons per hour.



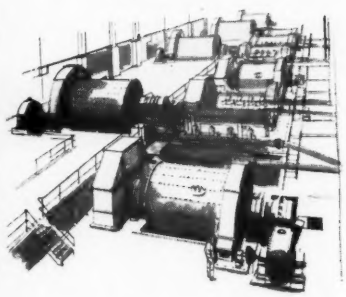
FOR REDUCTION CRUSHING

Symons Cone Crushers are built in both Standard and Short Head types, in sizes from 22″ to 7′ in diameter. Capacities from 6 to 900 or more tons per hour.



FOR SCREENING

From scalping to fine screening, there is a Symons Screen built to do a better job at low cost. Let Nordberg experience help you select the screen best suited to your needs.



FOR WET AND DRY GRINDING

Nordberg Grinding Mills include Rod, Ball, Pebble, Tube and Compartment types, in sizes from 6′ to 13′ in diameter and up to 50′ in length.

SYMONS . . . A registered Nordberg Trademark Known Throughout the World.

NORDBERG MANUFACTURING COMPANY

MILWAUKEE 1, WISCONSIN

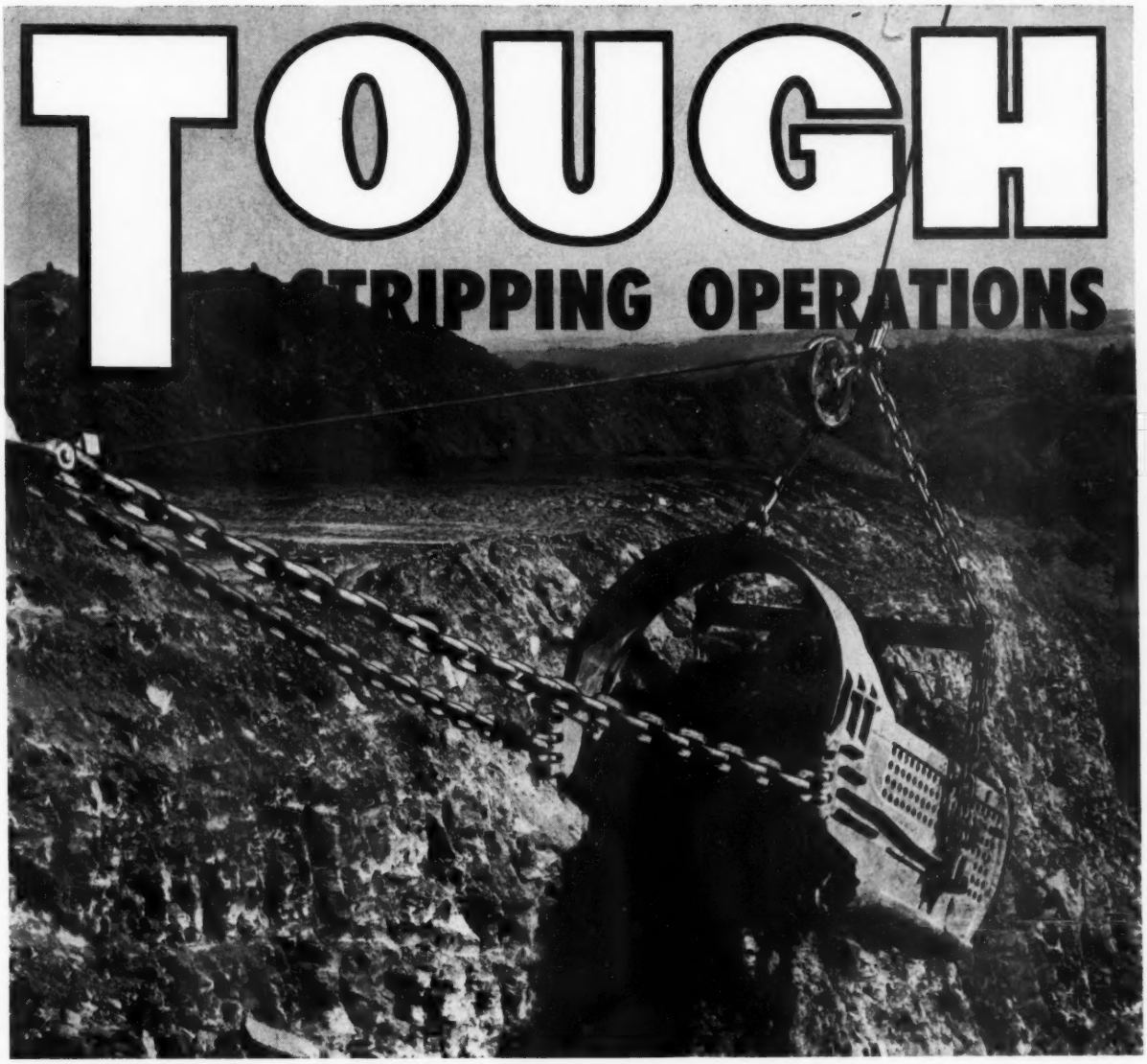
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M460

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SAN FRANCISCO · TAMPA · WASHINGTON · TORONTO · VANCOUVER · JOHANNESBURG · LONDON · MEXICO, D. F.

TOUGH

STRIPPING OPERATIONS



"MH"

HENDRIX

Heavy Duty Mining Buckets

TAKE THEM IN STRIDE!

4½ to 14 Cubic Yards With or Without Perforations

HENDRIX MANUFACTURING CO., Inc.

MANSFIELD, LOUISIANA

Hendrix DRAGLINE BUCKETS



Let us prove we can cut your bit costs

You be the judge

Let us show you, by actual demonstration, how Kennametal Bits can increase production and lower your mining costs. Just call your Kennametal Representative and he will put the wheels in motion.

First, he will come to your mine and view underground conditions, to determine the Kennametal Bit that will give the best results. At your convenience, he will provide the bits and assist in their installation. He will remain on hand during the test, to help in every possible way. Upon its completion, he will review the test data with you.

We know the results will favor Kennametal Bits . . . no matter what other bits you may now be using. But we want you to judge for yourself. And you can't compare bits on price . . . *the difference shows up in performance.*

Why not try it? You have nothing to lose. A test-demonstration will cost you nothing extra. If *you* decide the test has proved Kennametal Bits superior . . . then you pay for the bits used in the test. But if you think the test does not favor Kennametal, you only pay for the Kennametal Bits at your former bit cost. So, regardless of the results, you will pay no more than your present bit cost. Any *savings* we produce for you over your present average bit cost are clear profit for you.

Judge for yourself! Call your Kennametal Representative or contact us direct. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania. Phone: Bedford 755. 33533



INDUSTRY AND
KENNAMETAL
...Partners in Progress



MINING SHOW GOES TO LAS VEGAS

Another record-breaking Convention and Exposition in prospect—Industry gets set to turn out in force.

LAS VEGAS is bracing itself for the thousands of mining men and their ladies who will converge on the fabulous resort city from across the nation and around the world to attend the Number One mining event of the year—the 1960 Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress, October 10–13. The new, fully air-conditioned six-million dollar Convention Center will be the center of convention activities including the greatest mining machinery exhibition ever assembled for this industry.

Arrangements for the meeting have been under the direction of John C. Kinnear, Jr., General Manager, Nevada Mines Division, Kennecott Copper Corp., as chairman of AMC's Western Division. The following pages carry the full program for the convention sessions and descriptions of the highly educational exhibits, as well as an indication of the opportunities to exchange ideas with other mining men, that are in store for Convention-goers at Las Vegas.

Program Tailored to the Present

The National Program Committee, headed up by Chairman Oscar A. Glaeser, vice president and general manager of Western Operations, U. S. Smelting Refining & Mining Co., has scheduled a series of addresses that no one concerned with mineral production can afford to miss.

The sessions will include talks on National Mineral Policies, the State of the Mining Industries, Safety and Health, Open Pit and Underground Mining, Labor Relations, Milling and Metallurgy, Exploration and Geology, Public Lands, Management Tools and Techniques, Gold, Silver and Monetary Policies, Uranium, and General

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General Chairman



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Co-Chairman



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Photo Not Available

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Chairman



H. L. WALDTHAUSEN
Vice Chairman

Operating Problems. Two carefully planned symposiums—on Industrial Engineering and Underground Drilling—will consider important advances in these special fields. A Tax Panel—followed by an all day Forum for tax men—will round out the program. All of the sessions will be devoted to matters which the industry must deal with now.

In this important election year, speakers from the top ranks of the Democratic and Republican Parties will take part in the program by discussing the platforms of their parties as they affect the mining industry. Government officials responsible for mineral policies, prominent Congressmen and leading mining men will provide answers to many of the basic problems confronting the industry.

Among the nationally known Congressional figures who will participate in the convention are Senators Wallace F. Bennett of Utah, Alan Bible and Howard Cannon of Nevada, Barry Goldwater of Arizona, Thomas E. Martin of Iowa, James E. Murray of Montana, and Joseph C. O'Mahoney of Wyoming, and Congressman Wayne N. Aspinall of Colorado, Hale Boggs of Louisiana and John H. Dent of Pennsylvania.

Other prominent Federal, State and City officials on the program include Governor Grant Sawyer of Nevada; Elmer F. Bennett, Under Secretary of the Interior; Loren K. Olsen, Atomic Energy Commissioner; Edward Woozley, Director of the Bureau of Land Management; Edward P. Cliff, Assistant Chief of the U. S. Forest Service; Jay Glasmann, Special Assistant to the Secretary of the Treasury, and Mayor Oran Gragson of Las Vegas.

To Draft Policy Declaration

Under chairman Kenneth C. Kellar, Chief counsel of Homestake Mining Co., the Resolutions Committee, composed of top leaders from all branches of the mning industry, will draft a "Declaration of Policy," setting forth the industry's views on national issues. At appropriate times during the sessions, the "planks" of this platform—on which the industry will take its stand during the coming year—will be submitted for consideration by the full Convention.

Over 200 Exhibits

The 1960 Mining Show will feature displays by more than 200 exhibitors. They will have their best technical representatives on hand to discuss and demonstrate latest proven ma-

chinery and methods for effectively meeting the challenges facing the industry today. Two half-days are being left entirely free of other activity in order to allow plenty of time for studying the exhibits and conferring with manufacturers' representatives. These men—many of whom have had long operating experience themselves—will be glad to discuss specific operating problems and procedures as well as to furnish full information on their equipment.

The constant improvement and growth in the Mining Show attests to its value as an educational forum, available to every mining man.

Entertainment Unlimited

Las Vegas' top-flight entertainment attractions are so well known and so popular with visitors that no official AMC evening entertainment functions will be held. With all the leading resort hotels vying with each other for top talent, the choice is wide, and one or more different shows can be seen each night of convention week.

For the convenience of Mining Show visitors, a central bureau will be set up at which reservations may be made for both the dinner and the late shows.

The atmosphere of informality and good fellowship that pervades the old West awaits all convention-goers. Las Vegas offers a multitude of attractions, and the dry, warm, sunny climate is perfect for a busy schedule—or for complete relaxation after a day of activity. You write your own ticket to the enjoyment of this fabulous desert resort.

Special Program for the Ladies

A special invitation is extended to the miners' ladies to take in the convention "doings." They're welcome, in fact urged, to attend the convention sessions and to look over the exhibits. They are also particularly invited to join the other mining ladies at two daytime parties arranged by the Ladies Committee under the chairmanship of Mrs. Joseph W. Wells.

A luncheon and fashion show will be held Tuesday, October 11, at the New Frontier and Riviera Hotels. Because of the large number attending, the party will be divided, but each hotel will feature the same showing of latest fashions presented through the cooperation of several of the outstanding ladies shops.

A reception at the home of Mr. & Mrs. Wells, from 3:00 to 5:00 P.M. on Wednesday, is a gathering that the ladies won't want to miss. Special bus transportation will be provided to and from the Strip hotels—making it convenient for all to attend.

(Continued on page 56)

BOARD OF GOVERNORS

Western Division

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Gen. Mgr., Nevada Mine's Div.
Kennecott Copper Corp.

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CLAUDE O. STEPHENS, Pres., Texas Gulf Sulphur Co.
A. J. TESKE, Secy., Idaho Mining Association
D. W. VILES, Vanadium Corp. of America (retired)
C. F. WILLIS, State Secy., Arizona Small Mine Operators Assn.
S. H. WILLISTON, Exec. Vice Pres., Cordero Mining Co.
WALLACE G. WOOLF, The Bunker Hill Co. (retired)

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National Chairman
Program Committee



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Mississippi Valley



ROBERT J. LINNEY
Lake Superior



H. Z. STUART
Eastern States



ALBERT E. SEEP
Manufacturers



CONVENTION PROGRAM

MONDAY MORNING—OCT. 10

9:40 A.M. Pre-Session Motion Picture

"Nevada and Its Natural Resources"

10:00 A.M. WELCOMING CEREMONIES; NATIONAL MINERAL POLICIES

Presiding

JOHN C. KINNEAR, JR., Gen. Mgr., Nevada Mines Division, Kennecott Copper Corp., McGill, Nev.; Chairman, Western Division, American Mining Congress

Invocation

REV. WALTER W. HANNE, Minister, First Presbyterian Church, Las Vegas

Placing of the Colors

Welcome to Nevada

HON. GRANT SAWYER, Governor of Nevada

HON. ORAN GRAGSON, Mayor of Las Vegas

Responses

RAYMOND E. SALVATI, Pres., Island Creek Coal Co., Huntington, W. Va.; President, American Mining Congress

OSCAR A. GLAESER, Vice Pres. & Gen. Mgr. of Western Operations, U. S. Smelting Refining & Mining Co., Salt Lake City; National Chairman, Program Committee

ALBERT E. SEEP, Pres., Mine & Smelter Supply Co., Denver; Chairman, AMC Manufacturers Division

JESSE F. CORE, Vice Pres.-Operations-Coal, U. S. Steel Corp., Pittsburgh; Chairman, AMC Coal Division

Introduction of Distinguished Guests

Presentation of Tributes of Appreciation to—

HON. JAMES E. MURRAY, U. S. Senator from Montana
HON. THOS. E. MARTIN, U. S. Senator from Iowa
HON. JOSEPH C. O'MAHONEY, U. S. Senator from Wyoming
(Who are voluntarily retiring from Congress after long and distinguished careers—in recognition of their tireless efforts in furtherance of sound mineral policies.)

★ ★ ★

Chairman

HON. ALAN BIBLE, U. S. Senator from Nevada

The Minerals Platform of the Democratic Party

A prominent official of the Democratic Party

The Minerals Platform of the Republican Party

A prominent official of the Republican Party

Resolutions Committee Reports

General Policy
National Mineral Policies
Solid Fuels

●

MONDAY AFTERNOON—OCT. 10

Entire Afternoon Open for Inspection of Exhibits

4:00 P.M. MEETING, WESTERN GOVERNORS MINING ADVISORY COMMITTEE

TUESDAY MORNING—OCT. 11

9:40 A.M. Pre-Session Motion Picture

"Alaska and Its Natural Resources"

10:00 A.M. PUBLIC LANDS

Chairman: HON. WAYNE N. ASPINALL, U. S. Representative from Colorado

The Implications of Wilderness Legislation

RUSSELL H. W. CHADWICK, Exploration Geol., Bear Creek Mining Co., Spokane
WILLIAM D. HAGENSTEIN, Exec. Vice Pres., Industrial Forestry Association, Portland, Ore.

Are Public Lands Contributing All They Should to Development of the West?

HON. ELMER F. BENNETT, Under Secretary of the Interior

Proposals to Deal With the "Pre-Discovery Problem"

CHARLES F. BARBER, Vice Pres. & Gen. Counsel, American Smelting & Refining Co., New York

(Continued on next page)

ON THE PROGRAM



GRANT SAWYER
Governor of Nevada



ORAN GRAGSON
Mayor of Las Vegas



W. F. BENNETT
Senator from Utah



ALAN BIBLE
Senator from Nevada



HOWARD CANNON
Senator from Nevada



BARRY GOLDWATER
Senator from Arizona



THOS. E. MARTIN
Senator from Iowa



JAMES E. MURRAY
Senator from Montana

Problems Under the Multiple Use Laws

HON. EDWARD P. CLIFF, Assistant Chief, U. S. Forest Service

HON. EDWARD WOOZLEY, Director, Bureau of Land Management

Resolutions Committee Reports

Public Land Policy
Water and Air Pollution

9:40 A.M. Pre-Session Motion Picture

"Come and Find Me"
(Exploration for Oil & Gas Reserves)

10:00 A.M. EXPLORATION AND GEOLOGY

Chairman: JAMES BOYD, Pres., Copper Range Co., Boston
Vice Chairman: ROGER H. MCCONNEL, Chief Geol., The Bunker Hill Co., Kellogg, Idaho

Mineral Resources on the Ocean Floor

JOHN L. MERO, Research Engr., Institute of Marine Resources, Univ. of Calif., Berkeley

Metallogenic Maps of the United States

PHILIP W. GUILD, Chief, Base & Ferrous Metals Branch, U. S. Geological Survey

How a Small Mining Company Can Pursue Mineral Exploration

KARL J. SPRINGER, mining exploration & development enterprises, Toronto, Ont., and Vancouver, B. C.

Geologic Reconnaissance of Large Areas Leading to Economic Appraisal

E. E. THURLOW, Chief Mining Geol., Northern Pacific Railway Co., St. Paul

A Large Company and Worldwide Exploration

GLENN C. WATERMAN, Chief Geol., The Anaconda Company (Canada) Ltd., Toronto, Ont.

Discussion

EVAN JUST, Head, Dept. of Mineral Engineering, Stanford Univ., Stanford, Calif.

9:40 A.M. Pre-Session Motion Picture

"The Big Reach" (Story of Lunar Probes)

10:00 A.M. GENERAL OPERATING PROBLEMS

Chairman: WESLEY P. GOSS, Pres., Magma Copper Co., Superior, Ariz.
Vice Chairman: JOHN BLEY, Vice Pres., American Chrome Co., Nye, Mont.

Freeport's Off-Shore Sulphur Property at Grand Isle

PAUL D. BYBEE, Gen. Supt., Grand Isle Mine, Freeport Sulphur Co., Grand Isle, La.

Preliminary Engineering and Water Control for the Caland Operation at Steep Rock Lake

P. P. RIBOTTO, Vice Pres., Caland Ore Co., Atikokan, Ont.

Use of Radio Communication in Small Mining Operations

ARTHUR W. WOODS, Mine Supt., Trace Elements Corp., Maybell, Colo.

Economics of Truck vs. Belt Haulage

PETER NALLE, Supt. of Mining, Riverside Cement Co., Riverside, Calif.

D. M. COOPER, Senior Mining Engr., U. S. Borax & Chemical Corp., Boron, Calif.

TUESDAY AFTERNOON—OCT. 11

1:40 P.M. Pre-Session Motion Picture

"Gift of Kings"
(Story of Gems and Gem Stones)

2:00 P.M. TAX PANEL

Presiding: HON. THOS. E. MARTIN, U. S. Senator from Iowa

HON. WALLACE F. BENNETT, U. S. Senator from Utah

HON. HALE BOGGS, U. S. Representative from Louisiana

HON. JAY GLASMANN, Special Assistant to the Secretary of the Treasury

ELLSWORTH C. ALVORD, Alvord & Alvord, Washington, D. C.; Tax Counsel, American Mining Congress

Resolutions Committee Report

Taxation and Government Expenditures

3:00 P.M. INDUSTRIAL ENGINEERING SYMPOSIUM

Chairman: PAUL DASHINE, Pres., Calumet Div., Calumet & Hecla, Inc., Calumet, Mich.

Survey of Industrial Engineering in the Mining Industry

R. M. STEWART, Dir., Mining Research, and S. W. HURLBUT, Senior Research Engr., The Anaconda Co., Butte, Mont.

Discussion Speakers

BENTON BOYD, Mgr., U. S. and Lark Mine, U. S. Smelting Refining & Mining Co., Salt Lake City

M. J. O'SHAUGHNESSY, Asst. Gen. Mgr., Nevada Mines Div., Kennecott Copper Corp., McGill, Nev.

CHARLES A. CLEEVES, Asst. Mine Supt., Climax Molybdenum Co., Climax, Colo.

MEREDITH SMITH, Staff Mgr. of Industrial Engineering, International Minerals & Chemical Corp., Carlsbad, N. Mex.

1:40 P.M. Pre-Session Motion Picture

"The Quota" (Safety Hints)

2:00 P.M. SAFETY AND HEALTH

Chairman: S. S. GOODWIN, Vice Pres., New Jersey Zinc Co., New York

Vice Chairman: JOHN W. WARREN, Chief Ventilation and Industrial Hygiene Engr., The Anaconda Co., Butte, Mont.

Radiation Control in Uranium Mining and Milling

ROBERT G. BEVERLY, Administrator, Radiation Controls, Union Carbide Nuclear Co., Grand Junction, Colo.

(Continued on next page)



J. C. O'MAHONEY
Senator from Wyoming



WAYNE N. ASPINALL
Congressman from Colorado



HALE BOGGS
Congressman from Louisiana



JOHN H. DENT
Congressman from Pennsylvania



ELMER F. BENNETT
Undersecretary of the Interior



LOREN K. OLSON
Member, Atomic Energy Commission



J. ALLEN OVERTON, JR.
Vice Chairman, U. S. Tariff Commission



JAY GLASMANN
Special Assistant to the Secretary of the Treasury



EDWARD WOOZLEY
Director, Bureau of Land Management



EDWARD P. CLIFF
Assistant Chief, U. S. Forest Service

TUESDAY AFTERNOON, OCT. 11 (cont.)

Fighting Underground Mine Fires With Foam Producing Detergents

BERNARD W. CAREY, Asst. Supt., Pickands Mather & Co., Ironwood, Mich.

Blasting in Open Pit Mining for Maximum Safety

EMERY C. OLSEN, Supv. of Mine Inspection, Mines & Quarries, Columbia-Geneva Steel Div., Dragerton, Utah

Panel on Dust Control in Mining Operations

Moderator: E. P. PFLEIDER, Head, School of Mines and Metallurgy, Univ. of Minnesota, Minneapolis

Panelists:

RONALD E. BALES, Asst. Chief, Occupational Health Field Station, U. S. Public Health Service, Salt Lake City

L. B. BERGER, Chief, Division of Accident Prevention & Health, U. S. Bureau of Mines, Washington, D. C.

HOWARD L. HARTMAN, Head, Dept. of Mining, Pennsylvania State Univ., University Park, Pa.

FRANK J. LAIRD, JR., Asst. Chief Ventilation & Industrial Hygiene Engr., The Anaconda Co., Butte, Mont.

1:40 P.M. Pre-Session Motion Picture

"Lifelines U.S.A."
(Story of the Merchant Marine)

2:00 P.M. OPEN PIT MINING

Chairman: ROBERT J. LINNEY, Pres., Reserve Mining Co., Silver Bay, Minn.

Vice Chairman: WILLIS H. WAMSLEY, Mine Supt., U. S. Borax & Chemical Corp., Boron, Calif.

Reynolds' Open Pit Mining of Bauxite in Arkansas

JULIAN A. FULLER, Supt. of Surface Operations, and J. R. KRAUSE, Chief Engr., Reynolds Mining Corp., Bauxite, Ark.

Maintenance of Open Pit Equipment

R. Y. JENSEN, Asst. Chief Engr., The M. A. Hanna Co., Cleveland

Discussion

CHARLES L. BOISE, Asst. Supt., Isbell Construction Co., Sahuarita, Ariz.

Economics of Various Methods of Overburden Stripping

J. V. OTTER, Engr.-Special Services, Morrison-Knudsen Co., Inc., Boise, Idaho

Economics of Large Tires for Earthmoving Equipment

G. E. DANBY, Mgr., Sales Development, Euclid Div., General Motors Corp., Cleveland

WEDNESDAY MORNING—OCT. 12

Entire Morning Open for Inspection of Exhibits

12:00 Noon LUNCHEON, BOARD OF GOVERNORS, WESTERN DIVISION, A.M.C.

WEDNESDAY AFTERNOON—OCT. 12

1:40 P.M. Pre-Session Motion Picture

"Piercing The Unknown"
(Story of Outer Space)

2:00 P.M. LABOR RELATIONS

Chairman: OSCAR A. GLAESER, Vice Pres. & Gen. Mgr. of Western Operations, U. S. Smelting Refining & Mining Co., Salt Lake City

The Labor Scene in 1960

HON. BARRY GOLDWATER, U. S. Senator from Arizona

A Practical Approach to Labor Relations

J. S. PARKER, Vice Pres., General Electric Co., New York

Cooperation Between Labor and Industry

HON. JOHN H. DENT, U. S. Representative from Pennsylvania

Resolutions Committee Reports

Labor Relations and Labor Legislation

Mine Safety

1:40 P.M. Pre-Session Motion Picture

"Freedom Highway" (U.S. Historic Points)

2:00 P.M. UNDERGROUND MINING

Chairman: JAMES S. WESTWATER, Vice Pres.-Mining, Cleveland-Cliffs Iron Co., Cleveland

Vice Chairman: L. W. CASTEEL, Asst. Div. Mgr., St. Joseph Lead Co., Bonne Terre, Mo.

Mining Huge Ore Bodies in Sweden

INGVAR JANELID, Prof. of Mining, Royal Institute of Technology, Stockholm, Sweden

Developments in Large Borehole Drilling

H. E. MAUCK, Vice Pres.-Operations, Freeman Coal Co., Chicago, and D. C. RIDENOUR, Gen. Supt., Olga Coal Co., Coalwood, W. Va.

Inland Converts Drum Hoist to Koepe Friction Type for Greater Depth

J. R. GRONSETH, Mech. Engr., Inland Steel Co., Ishpeming, Mich.

Special Features of Hoist Installation at the Galena Mine

NORMAN VISNES, Supt., Galena Unit, American Smelting & Refining Co., Wallace, Idaho

Slusher Operation in Narrow Veins

WILLIAM H. HARRISON, JR., Gen. Mine Supt., Aluminum Co. of America, Rosiclare, Ill.

1:40 P.M. Pre-Session Motion Picture

"Sulfur"

2:00 P.M. MILLING AND METALLURGY

Chairman: R. R. MCNAUGHTON, Mgr., Metallurgical Div., Consolidated Mining & Smelting Co., Trail, B. C.

Vice Chairman: C. K. MCARTHUR, Dir. of Met. Research, Utah Construction & Mining Co., San Francisco

Instrumentation for Process Control in the Milling of Copper-Molybdenum and Potash Ores

GEORGE ATWOOD, Vice Pres. & Gen. Mgr., and J. P. MCCARTY, Instrument Engr., Duval Sulphur & Potash Co., Tucson, Ariz.

Instrumentation and Automation of Plant Operations

R. G. PATTERSON, Production Mgr., California Portland Cement Co., Los Angeles

The Krupp-Renn Direct Reduction Process

MAX KENNARD, Vice Pres., Southwestern Engineering Co., Los Angeles

Developments in Autogenous Grinding

BUNTING S. CROCKER, Vice Pres., Kilborn Engineering, Ltd., Toronto, Ont.

Plastics in Metallurgy for Resistance to Abrasion and Corrosion

WAYNE C. HAZEN, Senior Research Engr., Kerr-McGee Oil Industries, Inc., Golden, Colo.

THURSDAY MORNING—OCT. 13

9:40 A.M. Pre-Session Motion Picture

"Washington at Work"

10:00 A.M. STATE OF THE MINING INDUSTRIES

Chairman: HON. HOWARD CANNON, U. S. Senator from Nevada

Policies and Procedures of the Tariff Commission

J. ALLEN OVERTON, JR., Vice Chairman, U. S. Tariff Commission

Nonferrous Metals

SIMON D. STRAUSS, Vice Pres., American Smelting & Refining Co., New York

Discussion

CLARK L. WILSON, Chairman, Emergency Lead-Zinc Committee, Washington, D. C.

Iron Ore

C. F. BEUKEMA, Pres., Oliver Iron Mining Division, U. S. Steel Corp., Duluth, Minn.

Light Metals

LAWRENCE LITCHFIELD, JR., Exec. Vice Pres., Aluminum Co. of America, Pittsburgh

Solid Fuels

WALTER F. SCHULTEN, Vice Pres., Consolidation Coal Co., Pittsburgh

Industrial Minerals

BERNARD J. O'NEILL, JR., Geol., Dept. of Earth Sciences, Stanford Research Institute, Palo Alto, Calif.

Special Metals and Rare Earths

STEPHEN YIH, Vice Pres. & Gen. Mgr., Wah Chang Corp., Albany, Ore.

Strategic Minerals

S. H. WILLISTON, Exec. Vice Pres., Cordero Mining Co., Palo Alto, Calif.

Resolutions Committee Reports

Government Reorganization
Mine Financing

9:40 A.M. Pre-Session Motion Picture

"White Wonder" (Story of Salt)

10:00 A.M. UNDERGROUND MINING

Chairman: S. K. DROUBAY, Vice Pres. & Gen. Mgr., United Park City Mines Co., Salt Lake City
Vice Chairman: DONALD T. DELICATE, Asst. Mgr., Homestake Sapin Partners, Grants, N. M.

Practical Use of Rock Mechanics

SETH D. WOODRUFF, Civil Engrg. Associate, Dept. of Public Works, City of Los Angeles

Alimak Raise Climber

BEE R. WAPLES, JR., Chief Engr., Shattuck Denn Mining Co., Humboldt, Ariz.

New Drifting Methods at Britannia Mine

DONALD W. PRINGLE, Mgr., and HERBERT SHUTTLEWORTH, Mine Supt., Howe Sound Co., Britannia Div., Britannia Beach, B. C.

Underground Ammonium Nitrate Blasting

A. V. MITTERER, Mining Engr., Mining and Exploration Dept., Skokie, Ill., and BEN T. PHILLIPS, JR., Mining Engr., Mine Dept., Carlsbad, N. M.; International Minerals & Chemical Corp.

An Application of Nuclear Detonations to Block Caving

WILLIAM FLANGES, Supt. of Tunnels, Nevada Test Site, Mercury, Nev., and L. E. SHAFFER, Prof. of Mining, Univ. of Calif., Berkeley

9:40 A.M. Pre-Session Motion Picture

"Target Toquepala"

10:00 A.M. OPEN PIT MINING

Chairman: WALTER C. LAWSON, Vice Pres. & Gen. Mgr., Phelps Dodge Corp., Douglas, Ariz.
Vice Chairman: NEIL O. JOHNSON, Operations Mgr., Foote Mineral Co., Kings Mountain, N. C.

Open Pit Operations in the Gas Hills Area of Wyoming

ROY COULSON, Div. Supt., Vitro Minerals Corp., Riverton, Wyo.

Scientific Techniques in Control of Open Pit Slopes

ADOLPH SODERBERG, Consulting Mining Engr., Western Mining Divisions, Kennecott Copper Corp., Salt Lake City

Cement Raw Materials—Variety in Mining

EDWARD B. CONNORS, Mining Engr., Permanente Cement Co., Oakland, Calif.

New Developments in Initiation of Blasts in Mining

HARLAN J. POEL, Mgr., Technical Service Section, Explosives Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Innovations in Ammonium Nitrate Blasting Mixtures

D. M. STROMQUIST, Tech. Repr., Coal Chemical Sales Div., U. S. Steel Corp., Salt Lake City

10:00 A.M. TAX FORUM

Chairman: LINCOLN ARNOLD, Chairman, Tax Committee, American Mining Congress

Discussion of current tax problems of the mining industry—for accountants and others handling tax matters and all interested mining men.

12:15 Luncheon Meeting, A.M.C. Lands & Water Use and Land & Water Use Technical Committees, and National Coal Association Land and Water Use Committee

(Continued on next page)

THURSDAY AFTERNOON—OCT. 13

1:40 P.M. Pre-Session Motion Picture
"A City is Born" (Canada's Uranium Capital)

2:00 P.M. URANIUM

Chairman: EUGENE B. HOTCHKISS, Exec. Vice Pres., Vitro Minerals Corp., New York

Future Status of Domestic Purchase Program and of Foreign Purchase Commitments
HON. LOREN K. OLSON, Member, U. S. Atomic Energy Commission

Meeting World Power Needs for the Next Hundred Years
WILLIAM B. MURRAY, Exec. Asst. to the Pres., Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

Resolutions Committee Report
Uranium

3:00 P.M. GOLD, SILVER AND MONETARY POLICIES

Co-Chairmen:
MERRILL E. SHOUP, Pres., Golden Cycle Corp., Colorado Springs, Colo.
H. B. JOHNSON, Mgr., Sunshine Mine, Sunshine Mining Co., Kellogg, Idaho

Gold, Silver and Monetary Problems
DR. ELGIN GROSECLOSE, Groseclose, Williams & Associates, Financial Analysts and Consultants, Washington, D. C.

Discussion by Co-Chairmen

Resolutions Committee Report
Gold, Silver and Monetary Policies

1:40 P.M. Pre-Session Motion Picture
"Research in Steel"

2:00 P.M. MANAGEMENT TOOLS AND TECHNIQUES

Chairman: E. I. RENOUARD, Vice Pres., Western Operations, The Anaconda Co., Butte, Mont.
Vice Chairman: PAUL GEMMILL, Gen. Mgr., Combined Metals Reduction Co., Pioche, Nev.

The Realities of Free Enterprise
E. M. NAUGHTON, Pres., Utah Power & Light Co., Salt Lake City

Research Scientist, The Care and Feeding Of
JACK W. DUNLAP, Dunlap & Associates, Stamford, Conn.

What the Management Consultant Can Do for the Mining Industry
SHERRILL A. PARSONS, Coordinating Partner—Western Region, Booz, Allen & Hamilton, San Francisco

Computers in the Mining Management System
WALTER H. SCHWEDES, Senior Application Engr.-Mining, General Electric Co., Schenectady, N. Y.

Changes and Challenges in the Managerial Function
W. PHIL HERRIOTT, Dir. of Education & Training, United Airlines, Cheyenne, Wyo.

(Continued on page 44)


HORACE M. ALBRIGHT


GEORGE J. CLARK


HERBERT C. JACKSON


MERL C. KELCE


CHARLES J. POTTER


L. J. RANDALL


HARRIE S. TAYLOR


L. NEWTON THOMAS

AMERICAN MINING CONGRESS



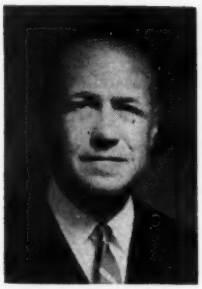
RAYMOND E. SALVATI
President



CHARLES R. COX



DAVID E. DAVIDSON



ANDREW FLETCHER



GEORGE H. LOVE



F. S. MULOCK



FRANK NUGENT



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H. A. SAWYER



ELLERY SEDGWICK, JR.



ALBERT E. SEEP



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WILLIAM L. WEARLY



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Executive Vice President and Secretary



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Assistant Editor

Convention-Exposition

Mining Congress Journal

(*Continued from page 42*)

1:40 P.M. Pre-Session Motion Picture

"A Modern Story of Bituminous Coal"

2:00 P.M. UNDERGROUND DRILLING SYMPOSIUM

Chairman: CLAUDE O. DALE, Asst. Gen. Mgr., Chemicals & Metals Div., Eagle-Picher Co., Miami, Okla.

Underground Drilling at INCO

J. H. DEWEY, Drilling Research Engr., International Nickel Co. of Canada, Ltd., Copper Cliff, Ont.

Panel on Drilling and Maintenance Practices

Moderator: F. J. HALLER, Consultant, North Range Mining Co., Negaunee, Mich.

Co-Moderator: R. W. PERSONS, Mgr., Drill Steel Div., Crucible Steel Co. of America, New York; Chairman, AMC Underground Drilling Committee

Introductory Discussions

1. Scheduled Maintenance

RAYMOND STEWART, Chief Industrial Engr., Climax Molybdenum Co., Climax, Colo.

2. Overhaul and Repairs

E. B. OLDS, Mine Supt., The Bunker Hill Co., Kellogg, Idaho

3. Pointers for Improved Underground Drilling Techniques

WILLIAM C. CAMPBELL, Asst. Mine Supt., Homestake Mining Co., Lead, S. D.

1:40 P.M. Pre-Session Motion Picture

"Frontier Beyond the Sky"

2:00 P.M. MILLING AND METALLURGY

Chairman: JACK H. HOW, Pres., Western-Knapp Engineering Co., San Francisco

Vice Chairman: KENNETH L. TATMAN, Mill Supt., Idarado Mining Co., Telluride, Colo.

El Salvador Mill of Andes Copper Mining Co.

PETER B. HOBSBAWN, Mill Supt., Andes Copper Mining Co., Potrerillos, Chile

Construction of the New Mill and Surface Plant of the Lucky Friday Mine

J. GORDON CRAIG, Mill Supt., Hecla Mining Co., Wallace, Idaho

Iron Making by the Dwight-Lloyd McWane Process

ROBERT C. MCDOWELL, Pres., McDowell Co., Cleveland

Gravity Feed Heavy Media Cyclone

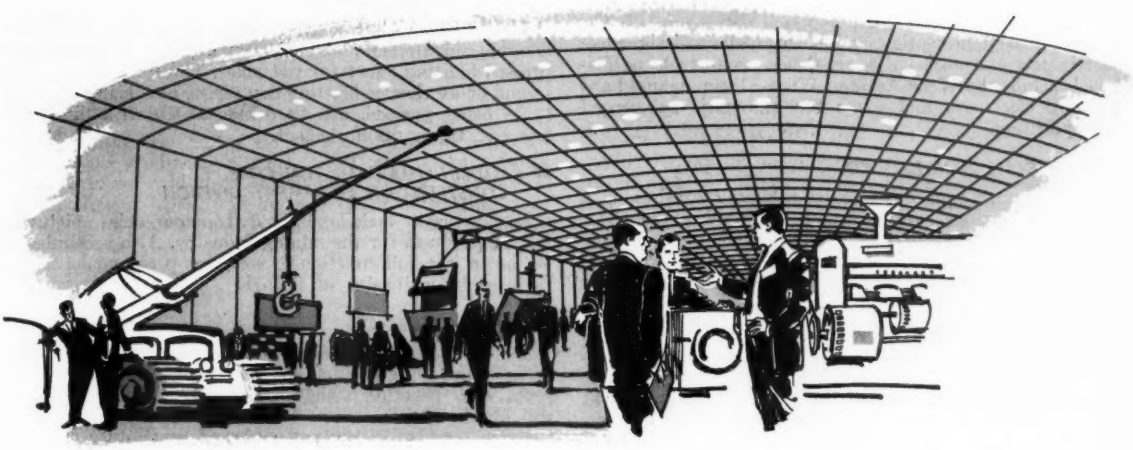
H. F. KULLBERG, Mgr., Minnesota Ore Div., Jones & Laughlin Steel Corp., Virginia, Minn.

Developments in the Treatment of Rare Metals and Minerals

A. J. KAUFFMAN, JR., U. S. Bureau of Mines, Albany, Ore.

FRIDAY—OCT. 14

TRIPS: 8:00 A.M. Mines and Plants in Las Vegas area; 8:30 A.M. Kennecott's Nevada operations



The EXHIBITORS

The 1960 Exposition provides a golden opportunity to examine the latest tools for doing a better job of mining and processing our Nation's metals and industrial minerals. More than 200 manufacturers and suppliers are taking full advantage of Las Vegas' new Convention Center to display their newest and best equipment for today's modern operation. Wise mining men will study the following descriptions carefully, making note of the exhibits they especially want to see — to be sure of gaining the maximum educational value from this vast array of equipment



Albert E. Seep
Chairman
Manufacturers Division

■ ***ACME-HAMILTON MANUFACTURING CORP.***

An in-use type of display board will feature the company's line of hose, belting, and belting fabric.

■ ***AEROQUIP CORP., WESTERN DIVISION***

Products on display will include a full line of hydraulic, pneumatic, oil, water, and gas hose, plus a full line of quick connect self-sealing couplings. Featured will be hydraulic hose for 3000 psi operation in the 1½ and 2-in. sizes—with reusable end fittings.

■ ***ALIMAK CORP.***

Will feature the Alimak Raise Climber, a movable drilling platform. It climbs in a raise at any angle with an average speed of 50 fpm along a rack-equipped guide rail by means of three spring-loaded pinions, which are driven by an air motor through a gear box.

■ ***ALLIS-CHALMERS MANUFACTURING CO.***

The Construction Machinery Division is exhibiting the 225-hp HD-21 crawler tractor equipped with a cable dozer, a torque converter drive, and the 21000 engine. Other products to be exhibited are the HD-6G crawler tractor shovel with a 1½-cu yd bucket and a 72-hp diesel engine, and the TL-14 rubber-tired loader equipped with Tractomatic drive, 83-hp diesel engine, 1½-yd bucket and an exhaust scrubber.

■ ***ALLISON DIVISION, GENERAL MOTORS CORP.***

Five types of transmissions will be shown. Four of these are for off-highway installations, while the fifth is a fully automatic truck transmission for on-highway applications.

■ ***ALLOY RODS CO.***

Live demonstrations of the company's line of hard surfacing alloys will be featured, including the Wear-O-Matic

process for semiautomatic application of alloys designed to resist impact and abrasive wear. Other products to be displayed include the Wear-Arc and Wear-Flame manual hard surfacing electrodes and wires for automatic submerged arc application.

■ ALLOY STEEL & METALS CO.

Pacific mining equipment to be exhibited consists of a Slushmaster scraper equipped with renewable wear shoes for highly abrasive operations and its complete line of sheave blocks, including a Round-The-Corner sheave block with new universal mounting bracket.

■ AMERICAN AIR FILTER CO., INC.

A complete line of dust control products, all in operation, will be featured. Included will be dry collectors, wet collectors and fabric arresters. Highlight of the exhibit will be an initial showing to Mining Show visitors of the new Model B Amer-Jet reverse jet fabric collector. The exhibit will also include typical dust control applications in processing operations, including proper hooding and duct work for most efficient collection.

■ AMERICAN BRATTICE CLOTH CORP.

Will show its line of ABC brattice cloth of three jute grades, canvas, plastic and special-purpose material. Also to be shown are mine vent ventilation tubing, trolley guard, and powder bags, plus the new spirally-constructed wire-reinforced Mineduct exhaust tube.

■ AMERICAN CYANAMID CO. EXPLOSIVES & MINING CHEMICALS DEPARTMENT

Plans to feature some of its permissibles and high explosives for open pit and underground mining, plus blasting caps, blasting aids and accessories. The company's mining chemicals for metallic and non-metallic flotation will also be exhibited and several features of other Cyanamid products will be shown.

■ AMERICAN MANGANESE STEEL DIVISION AMERICAN BRAKE SHOE CO.

Exhibit will show by means of a flow chart arrangement the extent of the use of the company's alloys in the mining industry, from the open pit digging or underground mining through the processing of the ores. Also featured will be a display of Amsco's two-part tooth, showing how the point can be reversed to give double service life.

■ ARCAIR CO.

Live demonstrations of Arcair metal removal torches will be conducted. The patented Arcair process uses an electric arc to melt—compressed air to remove the liquefied metal.

■ ASEA ELECTRIC, INC.

Exhibit will present the company's mine hoist equipment, highlighting the benefits in using multirope friction drive hoists and all automatic operation. Model hoists, as well as samples and models of key equipment items, will be on display. Of particular interest, among the auxiliary equipment, will be an electric weighing device for measuring products. It is built on a magneto elastic effect.

■ ATLAS COPCO PACIFIC, INC.

Plans to feature its new portable rotary screw compressor, which provides 600 cfm and is powered by a 181-hp diesel engine. Other products that will be displayed are an 1140 cfm stationary compressor, a complete range of rock drills, Coromant integral and extension drills steels, the Cobra motor drill, drill steel grinders, and a complete array of Coromant tungsten carbide bits from 1¼ to 9 in. in diameter.

■ ATLAS POWDER CO.

Will feature Atlas pellets, a new physical form of ammonium nitrate, and several new explosives, including a pressed blasting agent for wet holes. The Rockmaster millisecond delay electric blasting cap series, now being extended to 38 firing periods, will be demonstrated with the actual firing of the ignition element.

■ BALDWIN-LIMA-HAMILTON CORP. CONSTRUCTION EQUIPMENT DIVISION

Display will include lighted transparencies picturing B-L-H products for the mining industry. Also scheduled to be shown is a full functioning new dump car model manufactured by a division of B-L-H.

■ BARBER-GREENE CO.

Scale models of bulk material stockpiling and reclaiming systems, including a radial stacker, tripper, and shuttle conveyor, and operating models of Telsmith Division equipment will highlight the exhibit. Cutaway illustrations will demonstrate features of two new series of heavy-duty belt conveyor idlers. Operating models of the Telsmith Super-Scrubber and Gyrasphere crusher and a heavy-duty apron feed model will be features of the display.

■ BARRETT, HAENTJENS & CO.

Description not available.

■ BATTELLE MEMORIAL INSTITUTE

Featured will be an operating model of a new process for the purification of rock salt. It utilizes thermoadhesive techniques for removing impurities from the mined mineral. Employing radiant heat, a selective heating process increases the temperature of the rock salt; the material is then carried on a resin-coated conveyor belt and the impurities, due to their higher temperatures, stick to the resin. At the end of the belt the purified salt is delivered into a hopper while the impurities drop into a second bin. Battelle developed the process for International Salt Co.

■ BEMIS BRO. BAG CO., FLEXIPIPE DEPARTMENT

Plans to exhibit safety yellow Nyprene and jute Flexipipe mine ventilation tubing. Various types of bags used by mining companies will also be shown, including explosive bags used for packaging ammonium nitrate, ore concentrate bags, sample ore bags, powder bags and Jackleg drill bags.

■ BETHLEHEM STEEL CO., PACIFIC COAST DIVISION

Yieldable mine roof arches will be displayed. Other steel products to be shown include drill steel, mine roof bolts and accessories, wire rope, and track accessories.

■ BIXBY-ZIMMER ENGINEERING CO.

Bixby-Zimmer welded stainless steel screens on a moving display will illustrate details of construction. Screens of all rod shapes and sizes will be shown along with the newer Twist-Rod and Flex-Rod screens.

■ BOSTON WOVEN HOSE & RUBBER DIVISION AMERICAN BILTRITE RUBBER CO., INC.

Featured will be the new BostRon conveyor belt which will not rot or mildew and will resist the usual hazards of moisture, chemicals, acids, impact and fatigue. Also highlighted will be Boston's method of Balanced Belt Construction, Dulon covers, and its complete line of industrial hose and V-belts.

■ BOYLES BROS. DRILLING CO. LTD.

Will introduce new models of underground and surface diamond drills and pumping units.

■ BRAD HARRISON CO.

Single and multi-conductor electrical connectors integrally molded in Neoprene for 600 to 7500 volt service will be

shown. In addition, there will be displayed a push-pull type and a bronze-encased coupling type for 600 volt service, and a multi-conductor high-voltage attachable type quick disconnect.

■ ***BRODERICK & BASCOM ROPE CO.***

Highlighting the display will be a miniature wire stranding machine producing stainless steel wire strand. Other products to be exhibited will include wire rope samples, braided sling samples, and an assortment of logging tools manufactured by the company's subsidiary, American Logging Tool Co.

■ ***BRUNNER & LAY, INC.***

Its line of drilling bits, drill steel, and drilling and pneumatic tool accessories will be shown. Also featured will be rope thread tools and new thread bit. A moving exhibit will couple and uncouple a string of Brunner and Lay rope thread tools—striking bar, carbide Rok-Bits, extension rod, coupling—to demonstrate ease of this operation.

■ ***BUCYRUS-ERIE CO.***

Following a "What's New from Bucyrus-Erie" theme, the exhibit will include scale models of a new 8 to 18-cu yd capacity quarry and mine shovel and a new wheel excavator. A new electrical control system for quarry-mine machines will also be presented. Exhibit photos will feature other B-E mining equipment, including the world's largest mobile land machine—the 115-yd 3850-B stripping shovel being built for Peabody Coal Co.

■ ***BUELL ENGINEERING CO., INC.***
CLASSIFYING SYSTEMS DEPARTMENT

Scaled working demonstration models of pneumatic classifiers for separation, sizing or dedusting of dry powdered materials will be featured.

■ ***CALCO SUPPLY CO.***

Description not available.

■ ***CARD IRON WORKS CO., THE C. S.***

Featured will be operating scale models of rocker dump type ore cars. Other highlights include a scale model of an automatic bottom-dump skip designed for close inspection and operation by visitors.

■ ***CARRIER CONVEYOR DIVISION, CHAIN BELT CO.***

See Chain Belt Co.

■ ***CASE CO., J. I.***

Description not available.

■ ***CATERPILLAR TRACTOR CO.***

Will have on display a wide variety of equipment. Traxcavator machines to be exhibited include two wheel loaders—the 2¾-yd 966 and the two-yd 944 with side dump bucket—and the new series track-type 2½-yd 977H with power shift and 50 percent more horsepower. Other attractions include the D9E—a track-type tractor with power shift, U dozer, tilt cylinder and Kelley ripper—and the D8H with power shift, hydraulic dozer and tilt cylinder, and No. 8 ripper. Rubber-tired equipment will include the 619-PR619 tractor-rear dump Athey wagon and the DW20-482 tractor-scraper combination. Three new diesel engines will complete the exhibit.

■ ***CHAIN BELT CO.***

The center of attraction will be a moving exhibit featuring the company's Carrier natural frequency vibrating conveyors, Rex belt conveyor idlers and pulleys, and Shafer self-aligning roller bearings. Rex power transmission and conveyor chain will also be displayed. Participating in the exhibit will be the company's chain and transmission, carrier conveyor, conveyor, and Shafer bearing divisions.

■ ***CHALLENGE-COOK BROS. INC.***

Will display its new six-wheel drive truck with a 45-ton bottom dump semi-trailer. The truck is an off-highway model that incorporates a 380-hp diesel engine connected to a Fuller nine-speed Roadranger which has air actuated range selector control. The trailer truss is designed from mechanical tubing integral with the side sheets. Each trailer axle has a service rating capacity of 30,000 lb.

■ ***CHAPMAN ENGINEERING SUPPLY CORP.***

Exhibit will feature Broomwade rotary air compressors, which are manufactured in England. Chapman has been selected as the exclusive distributor of these compressors in the U. S.

■ ***CHICAGO PNEUMATIC TOOL CO.***

Drilling equipment will highlight the exhibit. Included will be the G-900 Tracdril, a crawler-mounted percussion-type rig which is capable of drilling over either track at right angles and can cover a 180° arc with a 17-ft diam. The C-350 REICHdrill, a self-propelled crawler-mounted unit, will be the featured attraction of the rotary drilling equipment. Rated at four-in. hole capacity, it is adaptable to down-the-hole operations. Another new piece of equipment will be the CP-5 Inhole drill, designed for hard rock percussion drilling. Rounding out the exhibit will be an array of hand-held drills, sludge and sump pumps, and impact wrenches.

■ ***CHRISTENSEN DIAMOND PRODUCTS CO.***

A complete display of diamond coring bits, non-coring bits, and reaming shells will be shown. Of special interest will be various styles of the company's step-type bits. New products to be shown are percussion drilling equipment, tungsten carbide threaded bits, multi-pass tapered socket bits, and one-pass tapered socket bits.

■ ***CLARK EQUIPMENT CO., AUTOMOTIVE DIVISION***

Description not available.

■ ***CLARK EQUIPMENT CO.***
CONSTRUCTION MACHINERY DIVISION

Emphasis will be on the Michigan line. On display will be a 52-ton, 600-hp tractor dozer, a 262-hp tractor dozer and a 6-yd, 335-hp tractor shovel.

■ ***CLARKSON CO., THE***

Plans to feature its C Series slurry valve, designed specifically for flow control of abrasive and corrosive slurries, and its reagent feeders in stainless steel and PVC for liquid feeding applications. A new positive displacement proportioning pump, which provides precise metering of liquids under pressure, will also be shown.

■ ***CLIMAX MOLYBDENUM CO.***
A DIVISION OF AMERICAN METAL CLIMAX, INC.

The role of molybdenum in abrasion-resistant materials will be stressed with particular attention to three relatively recently developed materials: 15-3 with 15 percent chromium and three percent molybdenum; 12-2 with 12 percent manganese and two percent molybdenum; and 6-1 with six percent manganese and one percent molybdenum. The exhibit will show actual parts of these three grades that have seen service. In addition, marked grinding balls will be on exhibit to demonstrate how the Climax ball test can be used to measure the relative resistance of materials to grinding abrasion.

■ **COAST MANUFACTURING & SUPPLY CO.**

Latest developments in the fields of safety fuse, igniter cord and detonating fuse will be shown.

■ **COLORADO FUEL & IRON CORP., THE**

Exhibit will illustrate the many products manufactured by CF & I for the mining industry, including Wickwire rope, industrial screens, grinding balls and rods, rock bolts, Realock metallic lagging, chain link fence, and mine rails and accessories. In addition CF & I will have its traditional "hospitality center" complete with secretarial and phone service.

■ **COLUMBIA-GENEVA STEEL DIVISION UNITED STATES STEEL CORP.**

See United States Steel Corp.

■ **CONVEYOR BELT SERVICE, INC.**

A moving conveyor belt will demonstrate that damaged and worn belting can be completely repaired and reconditioned. Also featured will be various types of belting which have been repaired.

■ **CRUCIBLE STEEL COMPANY OF AMERICA**

Will exhibit samples of its products for the mining industry. Six product panels will show hollow drill steel, heavy duty coil springs, stainless and high alloy tubing, stainless sheet, stainless bar and wire, Max-el[R] alloy steel. Highlighted will be a huge industrial coil spring that will be shown for the first time.

■ **CUMMINS ENGINE CO., INC.**

The new turbocharged 700-hp VT-12 diesel engine will be introduced, plus two all new eight cylinder V type diesel engines. The naturally-aspirated V8-350 and the turbocharged VT8-430, are rated at 350 hp and 430 hp respectively and operate at a governed rotative speed of 2500 rpm. Other Cummins diesels to be displayed are Models C-160, NRTO-6 and NT-380.

■ **DAVEY COMPRESSOR CO.**

Plans to introduce a truck-mounted rotary drill known as the "Eager Beaver." This is a small drill in the 10,000-lb class which can be operated as a rotary unit or as a bottom hole percusion-type drill. Also on display will be portable compressors and hand held air tools for light mining operations.

■ **DENVER FIRE CLAY CO.**

Will exhibit materials and equipment used by the mining industry such as refractories; gas burners; assay, heat treating, and melting furnaces; and crucibles in both fire-clay grade and a new line of high grade crucibles manufactured in alumina, zirconia and magnesia.

■ **DERRICK MANUFACTURING CO.**

A 4 by 6-ft dry-type screening machine of the high frequency type will be displayed. Effective in handling separations at one-in. opening and finer, the unit operates at 3600 rpm, has an average power consumption of ¾ hp and can be wound for either 440 or 220 volts, 3-phase, 60-cycle operation.

■ **DETROIT DIESEL ENGINE DIVISION GENERAL MOTORS CORP.**

Display will feature six engines. The Series 53 line will be represented by the Model 4-53 industrial fan-to-flywheel engine, Model 6V-53 automotive fan-to-flywheel engine, and the Model 4-53 cutaway unit. Of the Series 71 engines, the Model 6V-71 cutaway engine and Model 12V-71 industrial fan-to-flywheel unit will be shown. Model 6-110 fan-to-flywheel engine will represent the Series 110 line.

■ **DIAMOND DRILL CONTRACTING CO.**

Exhibit will be made up of portable diamond core drills for surface and underground exploration, soils sampling, masonry and concrete testing and grout hole drilling. Highlights will be hand portable, one-man operated drills; a gasoline operated model for surface work, and one compressed air operated model for underground and inside work. The HW series core barrels will also be shown.

■ **DIAMOND IRON WORKS DIVISION GOODMAN MANUFACTURING CO.**

See Goodman Manufacturing Co.

■ **DIFFERENTIAL STEEL CAR CO.**

A side-dump Wagon Train with two-way side delivery will be featured. Consisting of a Powered Wagon pulling Trailing Wagons, the Wagon Train has a high ratio of payload to tare weight in both highway and off-highway models. The operator stays in the cab to dump.

■ **DORR-OLIVER INCORPORATED**

Through the use of models and illustrations, Dorr-Oliver will show its complete line of equipment for the mining industries. In addition to the standard line of agitation, classification, sedimentation, pumping, filtration and waste treatment units, the Dorreo FluoSolids system for roasting, calcination, drying and dry classification will be featured. Other specific units to be displayed include the DorrClone separator, the DSM screen and the D-O Siphonsizer, a hindered settling classifier with no moving parts.

■ **DOW CHEMICAL CO., THE**

In addition to offering coffee and a place to relax, the Dow exhibit will feature a broad range of chemicals of interest to the mining industry. Among these will be xanthates, Z-200 and Dowfroth 250 as flotation agents, Separan flocculating agent, Dowex ion exchange resins, Versene chelating agents, caustic soda, chlorine magnesium, calcium chloride, Chlorothene Nu, heavy liquids, pentachlorophenol, and Dowicide preservatives.

■ **ORENSTEIN-KOPPEL UND LUBECKER MASCHINENBAU (LINK-BELT CO.—U. S. REPRESENTATIVE)**

See Link-Belt Co.

■ **DU PONT DE NEMOURS & CO., INC., E. I.**

The du Pont Explosives Department will feature the new Acudet delay electric blasting caps and its complete line of du Pont blasting agents and blasting supplies.

■ **EIMCO CORP., THE**

Featured will be the first showing of a new underground loader, the Eimco 24. Display will also include a conveyor loader, a front-end loader with a 100-hp diesel engine, the EimcoBelt continuous vacuum filter, a Burwell filter, and a 12 by 12-ft Drivehead with platform lift. Representative examples of the "Stress Flow" casting techniques, developed by the company for construction of its new 103 crawler-tractor line, will complete the exhibit.

■ **ELECTRO-TECHNICAL LABS. DIVISION OF MANDREL INDUSTRIES**

Description not available.

■ **ENGINEERING & MINING JOURNAL**

Has scheduled a presentation of its varied publishing services designed to serve executive and operating management in the metal and nonmetallic mining industry.

■ **EQUIPMENT ENGINEERS INC.**

Highlighting the exhibit will be an operating Krebs cyclone constructed of transparent plastics to allow visual observation of the internal flow pattern. Both single and integral two-stage Krebs cyclones will be on display together

with the various apex assemblies and other parts showing design and construction features.

■ **ESCO CORP.** *(formerly Electric Steel Foundry Co.)*

A new ripper shank and point will be highlighted. Four points are available in 14, 16, 18 and 20-in. lengths for various ripping conditions. They are cast in a new Esco alloy steel specifically developed for ripping. Weld on noses are available for conversion of any shank to Esco ripper points.

■ **EUCLID DIVISION, GENERAL MOTORS CORP.**

Plans to feature four models of mining-construction equipment, two of which will be shown for the first time. The 425-hp "Twin" TC-12 crawler and the new 211-hp model C-6 crawler will be displayed, as well as the recently announced SS-3 scraper, the largest now manufactured by Euclid, and the new single engine R-40 rear dump. A special "Stop, Look and Listen" demonstration is planned to give complete information on all products exhibited.

■ **EXIDE INDUSTRIAL DIVISION ELECTRIC STORAGE BATTERY CO., THE**

Will exhibit a complete line of industrial batteries and chargers.

■ **FAIRCHILD AERIAL SURVEYS, INC.**

Exhibit will depict the various services, both engineering and exploration, offered by this company. Included in the visual presentation are the applications of aerial photography in damsite mapping, pit mining, volume computations, airborne magnetics for the oil and mining industries and Fairchild's latest geophysical service, the Airborne Gravity Meter.

■ **FAIRMONT MACHINERY CO.**

A heavy duty LeccoVib inclined vibrating scalping screen and a LeccoVib vibrating conveyor will be featured. Also to be shown are a line of standard shock resistant conveyor idlers and a pictorial presentation of various types of material handling and processing equipment manufactured by Fairmont and Lecco Machinery & Engineering Co.

■ **FARR CO.**

A new two-stage dry air cleaner for protecting engines, the RotoPamic, will be on display.

■ **FARRELL CHEEK STEEL CO.**

Expects to display its line of alloy steel mine car wheels and a complete line of alloy steel wire rope fittings.

■ **FARRIS ENGINEERING CORP.**

See Farris Flexible Valve Corp.

■ **FARRIS FLEXIBLE VALVE CORP.**

Will exhibit Farris flexible rubber pinch valves, manually operated valves, made in sizes from ½-in. to and including 12-in., and air operated valves from one-in. to and including ten-in.

■ **FILTRATION ENGINEERS DIVISION AMERICAN MACHINE & METALS, INC.**

Plans to exhibit a newly designed rotary vacuum disc filter in a small production size and its Filtration Fabrics Division will have on display a variety of filter media including the newest synthetic fiber materials.

■ **FLETCHER & CO., J. H.**

Exhibit will highlight Hi-Ex foam generation equipment for fighting mine fires. This unit will generate 12,000 cfm of foam and force it through a quarter of a mile of mine entries. This foam makes it possible to contain mine fires and at the same time allows access for fire-fighting personnel into the fire area. Demonstrations will show the equipment generating foam.

■ **FLEXIBLE STEEL LACING CO.**

A complete line of Flexco and Flexco Hinged heavy duty conveyor belt fasteners, tools, cutters and accessory items will be exhibited. A faster method of applying hinged fasteners 500X, 250X and 375 will be presented that will be of interest to users of conveyor belt fasteners. In addition, new countersinking tools will be introduced and demonstrated. These tools make it possible to countersink Flexco fasteners in heavy conveyor belt covers.

■ **FLYGT CORP.**

A color exhibit will feature a working model of the B-38L 1½-in. pump, a cutaway model of the B-80L three-in. pump, and other models in their line of electric submersible pumps.

■ **FULLER CO.**

Traylor exhibit will include full scale laboratory size gyratory and jaw crushers. Fuller will feature a rotary feed for volumetric control, a section of Airslide fluidizing conveyor, and an operating cutaway model rotary compressor.

■ **GALIGHER CO., THE**

Among the equipment to be exhibited will be the Vacseal pump, Agitair flotation machine, Galigher acid-proof sump pump, Geary-Jennings sampler, Galigher Delta valve, and Galigher squeeze valve. Some equipment will be in operation; in other cases, animated demonstrations and exploded views will point out features. Galigher valves will be introduced and displayed for the first time utilizing cutaway casings to provide a view of internal workings.

■ **GARDNER-DENVER CO.**

Products to be featured consist of air hoists, air slushers, stoper drills, Mole-Drils, sump pumps, steel rods and bits, drifter drills, air feed legs, and drills. Several new products will be formally introduced, including a mine carloader, line oilers, roof bolting drill, Mole-Dril bits, and bit grinders.

■ **GAR WOOD INDUSTRIES, INC.**

Will exhibit its new Mono-Shell hopper trailer. Demonstrations of the air-powered clamshell gates will be featured.

■ **GENERAL CABLE CORP.**

Samples of mining cables will be shown, featuring Super Service portable power and mining cables.

■ **GENERAL ELECTRIC CO., APPARATUS SALES DIVISION**

A camera mounted on the roof of the Convention Center overlooking the outside exhibit area will demonstrate the mining uses of closed circuit TV to viewers in the G. E. booth. Additional eye-catchers will be the X-ray Emission Gage, which analyzes materials in production, a digital control computer, and a large cutaway transparency of a motorized wheel. Mine load center equipment, gear motors, a model metal-clad switchgear, mining rectifier car, and friction mine hoist pictures will complete the display.

■ **GENERAL MILLS, INC.**

The Chemical Division of General Mills is featuring a continuous liquid ion exchange (LIX) demonstration unit to illustrate the use of the latest techniques in the LIX recovery of vanadium, employing the recently developed LIX reagents for alkaline and acidic media—Aliquat 336. The Special Commodities Division will be introducing new grades of Guartec and Galactasol guar gums used as flocculants, filter aids, and auxiliary ore dressing reagents by the mining industry.

■ **GEOLOGICAL DISPLAY U. S. DEPARTMENT OF THE INTERIOR**

The Geological Survey is completing a series of maps of the United States showing distribution of various metal

deposits in an attempt to relate metals to regional environment. Several of these metallogenic maps will be exhibited.

■ **GEOPHYSICAL INSTRUMENT & SUPPLY CO.**

Geophysical instruments for mining exploration and surveying will be highlighted. Products will include: ground-airborne magnetometers, geiger and scintillation counters, theodolites, portable refraction seismographs, ultraviolet lights and miscellaneous geologist field items.

■ **GOODMAN MANUFACTURING CO.**

A section of 42-in. Ropebelt conveyor for transporting ores and nonmetallic minerals will be shown. Featured units will include the latest in full-flex linked idler assemblies, crowned return idlers and rope supporting stands. Compact storage of all component units needed for a 200-ft extension of a 42-in. Ropebelt conveyor will also be exhibited.

■ **GOODRICH INDUSTRIAL PRODUCTS CO., THE B. F.**

New conveyor belts and the Koroseal welding unit will highlight the display. The BFG Nycord line of conveyor belts, designed for operation on deep trough idlers, and numerous other belts will demonstrate the company's complete line of belt products available for material moving and power transmission. A model will show how rigid Koroseal vinyl can be welded into corrosion-resistant units for pipelines and fabricated parts. A variety of other B. F. Goodrich items will complete the exhibit.

■ **GOODYEAR TIRE & RUBBER CO., THE**

Description not available.

■ **GORMAN-RUPP CO., THE**

The 1960 Mining Show will be the first public showing of Gorman-Rupp's new submersible pump. The exhibit will include a production model, a plastic look-through model, and a cutaway. Powered by a five-hp electric motor, the pump has a three-in. discharge, and capacities range from 300 gpm at ten ft to 50 gpm at 100 ft of head. Other features will be a line of solids handling, self-priming centrifugal, and diaphragm pumps.

■ **GOULD-NATIONAL BATTERIES, INC. INDUSTRIAL DIVISION**

Will display the Silconic battery plate. All models of Gould's batteries including Thirty and Kathanode lines are available with this plate for mining applications.

■ **GRIPHOIST, INC.**

In addition to exhibiting improved models of its Griphoist Models T-20 and T-35, the company's new Bloestop safety devices will be shown to the mining industry for the first time. The Bloestops are made in two series—Series "A" for wire rope sizes 5/16 in.–⅜ in. and ½ in., and Series "B" for ⅝ in. wire rope.

■ **H & L TOOTH CO.**

Will display two-part hammer forged alloy steel teeth for two-yd to nine-yd shovel dippers, featuring replaceable wear plate adapters. Exhibit will also show the various stages of the making of a drop forged adapter and other excavating teeth and adapters used in strip mining operations.

■ **HAMMERMILL'S INC.**

See Universal Engineering Corp.

■ **HARDINGE CO., INC.**

Five working models—of the disc roll mill, the Electric Ear mill feed control, the Overdrain classifier, the Tricone mill and the Auto-Raise thickener—will be shown.

■ **HARNISCHFEGER CORP.**

Hub of the exhibit will be an 8000-lb operator's cab from a standard eight-yd P&H electric shovel rigged with authentic electronic controls. A specially adapted movie will be projected against the cab window directly in front of the operator's seat to give visitors an operator's eye-view of the shovel working through its complete operating cycle. Another authentic touch will be the presence of P&H's pressurizing system for the cab. The magnetorque, which is Harnischfeger's system of hoist motion drive, will be graphically explained by a separate exhibit within the cab.

■ **HAWTHORNE, INC., HERB J.**

Plans to show its line of Blue Demon all-formation drill bits for shot holes, blast holes, core holes and exploratory rotary drilling. A series of four bit bodies provide a complete range of sizes—each using expendable "throw away" blades.

■ **HEINRICHS GEOEXPLORATION CO.**

Products to be featured consist of new induced potential equipment, hand magnetometer, electromagnetic equipment, refraction seismic timer, resistivity equipment, Afmag equipment and gravity meter.

■ **HERCULES POWDER CO.**

The Hercol series of cap-sensitive, high-ammonia-content explosives and the Bulldog Delay series of blasting caps will be featured. The Hercol series are now available in cartridges of small diameters and standard lengths, as well as in the larger diameters and special packings.

■ **HEWITT-ROBINS**

An operating 60-ft Wire Rope Conveyor equipped with Style L idlers, Hewitt-Robins conveyor belting, and hydraulic takeup will be displayed. Other products to be exhibited include hi-speed vibrating screen, heavy duty vibrating feeder, a full line of belt conveyor idlers, speed reducers, screen cloth, and conveyor belting.

■ **HOUGH CO., THE FRANK G.**

Featured will be a tractor-shovel rated at 12,000-lb carrying capacity for truck loading, digging, stockpiling, and stripping. A new addition to the Hough line will be shown for the first time—the D-120 dozer.

■ **HUGHES TOOL CO.**

Display will spotlight the company's line of shaft cutters designed for drilling holes 28 in. up to 12 ft and larger in diameter. Also, a full range of sizes and types of Rota-Blast rock bits will be shown—each designed to penetrate a specific formation. All popular bit sizes are available from 3⅞ in. to 12¼ in., with both the regular air course and the air jet feature.

■ **HUMPHREYS ENGINEERING CO.**

A pictorial display will include a large map showing locations of all known spiral concentrator installations, large photographs of various spiral plants, and flowsheets of spiral concentrator circuits.

■ **INDUSTRIAL NUCLEONICS CORP. ACCURAY PROCESS CONTROL SYSTEMS**

Will exhibit several types of its AccuRay measurement and control systems. One of these will be a continuous on-stream composition analysis system for determining specific gravity, percent solids, or other density properties of fluids flowing in pipes. Also to be exhibited under operating conditions are the AccuRay continuous level measurement system and the AccuRay level detector controller. These systems continuously measure level of solids or liquids in tanks or bins from the exterior of the vessel.

■ **INDUSTRIAL PHYSICS AND ELECTRONICS CO.**

Proposes to exhibit a Con-O-Weigh compact weighing feeder featuring weighing and controlling with pneumatic belt scales, and a Con-O-Weigh pneumatic-electric continuous ball and disc integrator for Con-O-Weigh weighing systems. Also to be shown is a time modulated reagent feeding system for feeding liquid or slurried reagents—a system for manual control of reagents—and a system for automatic control of reagents will be demonstrated. A Detramp electronic tramp iron detector will be displayed in operation, and two models of the Transist-O-Trol transistorized probe switch for detecting ore levels, plugged chutes, and sump levels, will complete the exhibit.

■ **INGERSOLL-RAND CO.**

Among the equipment to be shown will be the Crawlmaster, several sizes of new hoists, at least one new pump, an XLE stationary compressor with new Tendamatic control, a new Jackdrill and stoper, four improved sizes of Downhole drill and some new designs of Carset bits. Emphasis will be on new and improved products.

■ **INTERMOUNTAIN RESEARCH & ENGINEERING CO., INC.**

Description not available.

■ **INTERNATIONAL HARVESTER CO.**

Four construction equipment units and three trucks will be displayed. Heading the construction equipment array will be the company's newest heavyweight crawler—the 230-hp turbocharged TD-25 which will be fitted with an Ateco ripper on the rear and a hydraulic dozer blade up front. Other products on exhibit will be the TD-15 Steel Mill Special crawler equipped with a Drott Skid-Shovel and two underground mine crawlers. The three off-highway trucks are a V-8, six-wheel unit and two lighter models—a 4 by 4 with pickup body and a Travelall with four-wheel drive.

■ **INTERNATIONAL NICKEL CO., INC., THE**

Exhibit will be principally devoted to featuring applications of Ni-Hard nickel-chromium abrasion-resistant iron in the grinding of metal ores. Secondary features will be uses of chromium-nickel stainless steels in certain refining applications and Inco's new nickel mining and smelting operations in northern Manitoba.

■ **INTRUSION-PREPAKT, INC.**

Intrusion Prepakt, Inc. and Selby Drilling Corp., have combined forces to offer a variety of services to the mining industry. These services include waterproof concrete tunnel plugs, cement and chemical grouting for water cutoff or stabilization in shafts and drifts, deep drilling, underground excavation and lesser services. Laboratory size kits will demonstrate how grouting is accomplished and how Prepakt tunnel plugs can be made under water. Other services will be illustrated and explained.

■ **JEFFREY MANUFACTURING CO., THE**

Is making every effort to provide a comfortable booth equipped with easy chairs, and cordially invites Mining Show visitors to meet Jeffrey representatives in a relaxing atmosphere.

■ **ISTOPES SPECIALTIES CO.**
DIVISION OF NUCLEAR CORPORATION OF AMERICA

Description not available.

■ **JORDAN INTERNATIONAL CO.**

Will show the Jalander Electronic Magnetometer. The range of this three-lb instrument is 10–250,000 gammas. It includes a magnetic transducer (oil damped) which automatically levels itself in the vertical direction, thus measuring the vertical magnetic field. The electronic part is transistorized and fed by four three-volt flashlight batteries. The instrument is built to face rough handling and is suitable for both arctic and tropical use.

■ **JOY MANUFACTURING CO.**

Will exhibit several new products for the first time, including a rotary-percussion underground rock drill; the TDH crawler percussion drill, equipped with six-in bore drifter; and the Joy-Hazemag impact crusher. A special display will be the new 965-BH Champion rotary blast hole drill which will sink up to nine-in. vertical or angle holes with a traveling, overhead drive that includes a four-step mechanical transmission to match torque and speed to the formation being drilled. New controls for slushers, new wire-line retractable core-barrel tools, plus fans, dust collection systems, conveyors, bits, sheaves, electrical connectors, and hand-held rock drills will round out the exhibit.

■ **KW-DART TRUCK CO.**

Reports that it will show "the world's largest end dump truck available to the mining industry." With a gross vehicle weight of 300,000 lb, the truck has a power train capable of delivering over 700 hp. The company will also exhibit one of the first units built by them, a 1903 model.

■ **KENNAMETAL INC.**
MINING TOOL DIVISION

Will have on display its line of carbide mining tools. Special emphasis will be on tungsten carbide inserts for percusion rock bits, drag bits and other tools; Kenface, tungsten carbide hardfacing; tungsten carbide components for rock crushing equipment; and tungsten carbide nozzles. Tools for mechanized mining that will be exhibited for the first time include coal cutter bits, roof bits, finger bits, augers and adapters. New drag bits for well drilling and blast hole drilling and matrix powders for diamond core bits will complete the exhibit.

■ **KRUPP INTERNATIONAL, INC./**
FRIED. KRUPP MASCHINEN- UND STAHLBAU RHEINHAUSEN

The Excavator & Materials Handling Division of Fried. Krupp recently introduced four new models of bucket wheel excavators, with capacities ranging from 100 to 800 cu yd per hour. The model to be exhibited at the Mining Show will strip 350 to 400 cu yd per hour.

■ **LAKE SHORE, INC.**

Working models will demonstrate the latest in automated hoisting machinery for coarse ore handling. One unit will be a scale model of the M. A. Hanna's Homer-Wauseca shaft indicating friction hoists, Jeto skips, and automated skip loaders. Other working models will demonstrate the open pit Jetincline skip and the new front discharge skips.

■ **LeBUS INTERNATIONAL ENGINEERS, INC.**

Display will consist of movies and discussions pertaining to LeBus Counterbalance Spooling System, a controlled system of spooling multi-layers of wire line. Advantages of the system on all types of hoisting equipment will be stressed.

■ **LE ROI DIVISION**
WESTINGHOUSE AIR BRAKE CO.

Will exhibit a new line of drilling rigs and air tools.

■ **LESCHEN WIRE ROPE DIVISION**
H. K. PORTER CO., INC.

See Porter Co., Inc., H. K.

■ **LeTOURNEAU, INC., R. G.**

Plans to exhibit a "short lever" electric-wheel drive shovel —a type of front end loader—with 26-cu yd capacity. The company will illustrate other electric-wheel drive, open-pit equipment, including the TR-60 trolley-powered rear-dump truck that is seeing service at the Anaconda Company's Berkeley pit in Montana.

■ **LeTOURNEAU-WESTINGHOUSE CO.**

Will feature four pieces of equipment—the Model C

Tournatractor, a Model 660 motor grader and two Haulpak off-the-road rear dump trucks. Cutaway models and animated displays will round out the exhibit.

■ *LIBU SHOVEL CO (LOS ANGELES) INC.*

Plans to highlight the Libu three-way dump bucket with open sides, a Swedish world-patented invention.

■ *LINK-BELT CO.*

For the first time in this country, a full-sized bucket wheel excavator will be exhibited by Orenstein-Koppel und Lubecker Maschinenbau AG (LMG), for which Link-Belt has sales rights in both the United States and Canada. It has a capacity of 250 to 400 cu yd per hr. A model of an LMG wheel now in operation in India will also be shown. In addition, Link-Belt's new 35° troughed belt conveyor idlers will be displayed along with the latest material handling equipment and power transmission components for the metal mining industry.

■ *LONGYEAR CO., E. J.*

Diamond core drilling equipment and drills will be featured. Included will be wireline core barrels and a selection of diamond bits. Display boards will illustrate the company's contract drilling activities and its mining and geological consultation services.

■ *LUBRIPLATE DIVISION FISKE BROTHERS REFINING CO.*

Display will consist of mechanical exhibits demonstrating the suitability of the latest Lubriplate lubricants for the mining industry. Specimens and samples of the various lubricants will also be available for examination and demonstration.

■ *LUG-ALL CO., THE*

Emphasis will be on its line of lightweight Lug-All winch hoists in capacities from one half to two tons and with cable lengths up to 38 ft. Of particular interest to mining men will be a special rust and corrosion resistant "marine" series of hoists featuring stainless steel cable, anodized castings and oiled-for-life bushings.

■ *McNALLY PITTSBURG MANUFACTURING CORP., THE*

Exhibit will feature the McNally Cradle Idler. A typical H-frame used to support the idler will be on display, and a replacement type idler will also be shown.

■ *MACHINERY CENTER, INC.*

Plans to display a sectionalized shaft operation with the Cryderman, the safety sinking skip and drill jumbo. Other products to be exhibited include an extendable hydraulic jib for mounting pneumatic drills for incline and horizontal tunnel driving; a retractable telescopic air leg mounting for rock drills; a slusher bucket of the non-burying type for soft ore conditions; an electric motor driven submersible pump; a diesel driven Dryer Electric Model TC fan, and an air motor driven, hydraulic pump system. New equipment will include a diesel powered self-loading material hauler for low height operation, and a tunnel loader machine complete with loading apparatus, belt conveyor, and built-in jumbo.

■ *MACK TRUCKS, INC.*

Two new, off-highway, rear-end dump trucks—the M40SX and the M30X—will be introduced. The M40SX, a 40-ton, six-wheel unit with two-man cab, features completely redesigned sheet metal and offers dual power steering, increased cooling capacity, Mack's exclusive balanced bogie, and a new high-capacity front axle. The M30X is a two-axle, 18-yd, 30-ton capacity truck. A third unit, the B813SX, an on- and off-highway, six-wheel, dumper chassis, will also be exhibited.

■ *MACWHYTE WIRE ROPE CO.*

Will have on display various types of wire ropes, including stainless steel and monel metal. Also featured will be various types of slings and Safe-Lock wire rope assemblies.

■ *MANCHA STORAGE BATTERY LOCOMOTIVE DIVISION GOODMAN MANUFACTURING CO.*

Two locomotives, a 1½-ton storage battery trammer and a 12-ton diesel unit, will highlight the exhibit. The trammer is designed for haulage and supply service in narrow drifts and features a hinged cab that permits short caging length. The 12-ton diesel is built for heavy duty main line haulage in mines and for tunnel driving. A torque converter in the transmission cushions the engine against shock loads and permits accelerating heavy trailing loads.

■ *MARION POWER SHOVEL CO. A DIVISION OF UNIVERSAL MARION CORP.*

A working model of a Type 151-M, seven cu yd shovel and a photo display of various sizes of Marion excavators used in the metal mining industry will be featured.

■ *MARTIN ENGINEERING CO.*

Products to be displayed include Vibrolator vibration inducers for movement, sifting or compaction of materials, parts, slurries or concretions in hoppers, screens, bins, chutes, and packaging operations. In addition, the company plans to exhibit a full line of vibration accessories and mounts, and a new CCV series heavy duty vibrator line will be introduced.

■ *MINE SAFETY APPLIANCES CO.*

For mine lighting, Edison Model S electric cap lamp with automatic low voltage charging equipment and MSA fluorescent light fixture will be featured. Electronic equipment to be shown will include transistorized audio tone transmission for remote control of fan, substations, etc., and MSA Minephone in conjunction with audio equipment and closed circuit television. With respiratory and breathing apparatus, the company will show the McCaa two-hour apparatus with the full vision facepiece. The new fixed crown suspension for MSA type K Skullgards will be exhibited along with personal protective equipment including safety clothing, belts, and first-aid supplies.

■ *MINE & SMELTER SUPPLY CO. MANUFACTURING DIVISION*

Will introduce to the mining industry two new products, soon to be available for commercial applications. One is in the field of comminution, the other in the overlapping fields of liquid removal, filtering and drying. There will be a working display of the Masseo-Grigsby rubber pinch valve —Hydral-Air operated—affording automation to valve applications.

■ *MINING CONGRESS JOURNAL*

Official publication of the American Mining Congress has gone all out to provide a comfortable booth for the footweary Mining Show visitor to "set and rest." Exhibit will feature MCJ's service for the entire mining indutsry.

■ *MINING WORLD*

Display will feature *Mining World* and *World Mining* services to the domestic and foreign mining industry.

■ *MISSION MANUFACTURING CO.*

Highlighted will be Mission's Hammerdril, a pneumatic tool produced in both low and high pressure models. Either can be used on any standard rotary drill rig with suitable air compressor capacity. An outstanding component of the bottom-hole impact tool is the Hammerbit which features six tungsten carbide inserts placed so as to produce maximum cutting efficiency and straight, full-gauge holes.

■ *MOTORAMIC INC.*

Will introduce the WEDA L3Z submersible drainage

pump with a built-in fully automatic overheat protection device. The system consists of built-in bi-metal breakers coupled in series with a contactor. When abnormally high operating temperature occurs, the device will automatically stop the pump. Immediately after the pump has cooled down to normal operating temperature and the fault has been corrected, the overheat protection device will restart the pump.

■ **MOTOROLA COMMUNICATIONS & ELECTRONICS, INC.**

Emphasis will be on the company's lines of radio communications equipment and closed circuit television equipment. Featured will be the Motrac extensively transistorized two-way radio. Also to be demonstrated are pocket sized and other portable radio transmitters, receivers and transceivers. The CCTV line will feature industrial monitors and cameras.

■ **NATIONAL CHEMSEARCH CORP.**

Description not available.

■ **NATIONAL ELECTRIC DIVISION H. K. PORTER CO., INC.**

See Porter Co., Inc., H. K.

■ **NATIONAL IRON CO.**

See Universal Engineering Corp.

■ **NATIONAL MALLEABLE & STEEL CASTINGS CO. CAPITOL FOUNDRY DIVISION**

Main attraction will be National rubber load suspension devices for mine cars. In addition, the National NC-1 mine car truck and Willison automatic couplers with National rubber cushioning devices will also be displayed. National's Capitol Foundry Division will also be a part of the display, showing its Naco alloy steel grinding balls plus numerous cast steel products.

■ **NATIONAL MINE SERVICE CO.**

A feature of this exhibit will be the new Wheat National Model electric cap lamps. Company officials and field representatives will discuss and demonstrate the lamps and other major equipment which includes exhaust gas conditioners for underground diesel-powered equipment; TorKar—a-c, d-c, and diesel shuttle cars; Greensburg locomotives and trammers; Marietta continuous miners; Quick Seal tamping plugs; Clarkson "Redbird" conveyor chain; Scandura P.V.C. conveyor belting; Riken gas indicators, and safety equipment.

■ **NEVADA BUREAU OF MINES**

"One-hundred Years of Mineral Industry" will be the theme for the exhibit to be presented by the Nevada Bureau of Mines and the Mackay School of Mines. A six-panel display will show highlights of the State's colorful mining history, its modern mineral production, and the public services and activities of the Bureau, the Nevada Mining Analytical Laboratory, and the School, all State agencies under the University of Nevada. A mineral display will include specimens of Nevada's metallic and non-metallic ores and unusual examples of finished mineral products.

■ **NEWMAN ELECTRIC MOTORS INC.**

Description not available.

■ **NEW YORK RUBBER CORP.**

Description not available.

■ **NORDBERG MANUFACTURING CO.**

In addition to working models of Symons cone crushers and screens, the exhibit will include two recent developments—the Nordbak, a new backing for manganese crusher parts involving a new method of application that requires no special pouring equipment or precautionary measures, and the Symons Protecto Lube System, a complete packaged lubricating unit designed primarily for Symons cone crushers and readily adaptable to other crushing and process machinery.

■ **ODGERS DRILLING, INC.**

Intends to display a pumping unit with generator, an under reamer and a casing cutter.

■ **OHIO BRASS CO.**

Display will include expansion shells and plugs for roof bolting, and roof plate hooks for supporting cable or pipe from roof bolt plates. In addition, a complete line of trolley and feeder fittings, including adaptors for yieldable arches, connectors, and splicers for aluminum or copper cable, will be shown. Other products to be exhibited are various types of current collectors for mine locomotives and safety materials such as fused taps, ground clamps, and circuit interrupters.

■ **OHMART CORP.**

Two translight displays will illustrate a number of Ohmart nuclear radiation gaging applications presently in use throughout the mining industry. For inspection purposes, a complete model PG density measuring assembly and an operating model GM-7 level gage will be available. Solids control of grinding mill output, mass flow measurement of slurries, density control of flotation media, and optimum solids control of dredging operations are a few of the applications handled by the PG gage. The GM-7 gage provides efficient level measurement of all types of vessels.

■ **OLIN MATHIESON CHEMICAL CORP. ENERGY DIVISION**

Stressing Olin explosives, the exhibit will display products merchandised by the Explosives Operations Department of the Energy Division.

■ **OSHKOSH MOTOR TRUCK, INC.**

Plans to exhibit a new model tractor-end dump trailer off-highway hauling unit. The Model W-3000 all-wheel drive tractor will be powered by a 525-hp V-12 diesel engine. The trailer, which has a 37 cu yd capacity, employs an exhaust heated subfloor.

■ **PARKERSBURG RIG & REEL CO.**

Will feature the Hydrotarder Brake for trucks, tractors, and hoisting equipment.

■ **PIONEER ENGINEERING DIVISION OF POOR & CO., INC.**

On display will be a Pioneer Oro manganese feeder. This full size cutaway will show the feeder's Supermang pans, rollers and sprocket rims. Also to be shown are an overhead eccentric jaw crusher and a vibrating screen. The screen features Pioneer's Iso-Vibe suspension design to isolate vibration of the screen pan.

■ **PIT & QUARRY PUBLICATIONS, INC.**

Copies of *Pit and Quarry* and *Pit and Quarry Handbook* will be on display. In addition, the exhibit will illustrate *Pit and Quarry* merchandising service for advertisers and marketing information on non-metallic minerals industries covered by the above publications.

■ **PLYMOUTH LOCOMOTIVE WORKS DIVISION OF THE FATE ROOT HEATH CO.**

A diesel mining locomotive equipped with an exhaust conditioner for underground operation will be operating at the Mining Show to demonstrate the controls and the exhaust conditioning. Also to be exhibited will be an F-R-H extrusion machine, a product of the company's Ceramic Machinery Division. From the company's Special Products Division will be shown a cleaning device, The Ideal Cleaning Stand.

■ **PORTER CO., INC., H. K.**
LESCHEN WIRE ROPE DIVISION
NATIONAL ELECTRIC DIVISION
THERMOID DIVISION

Leschen will display numerous samples of the various types, sizes, and constructions of Red-Strand wire rope used in mining operations. In addition, samples of Red-Strand wire rope slings will be exhibited.

■ **PROPELLEX CHEMICAL DIVISION**
CHROMALLOY CORP.

Will concentrate on its new Saf-T-Boost primers, especially suited to detonation of ammonium nitrate-fuel oil blasting agents.

■ **RKL CONTROLS, INC.**

Will have on display its complete line of pinch type valves—manually operated types, air operated types for automating mining processes and electrically operated types for electrical automation. In addition there will be new valves specifically designed for use with cone separators and valves for handling chemical slurries used in leaching and flotation processes. Also on display will be the company's new line of vibration joints and flexible members specifically designed for high abrasion and chemical resistance.

■ **RAMSEY ENGINEERING CO.**

Special instrumentation and control devices for the mining industry will be shown. In particular, the Ramsey conveyor scale will be demonstrated and controls for dense media plants covering density, sump level and circuit slime controls will be shown. An ore bin level computing and indicator device for use in solids storage bins will round out the exhibit.

■ **RAYBESTOS-MANHATTAN, INC.**
MANHATTAN RUBBER DIVISION

A conveyor belt for 45° idlers, the Ray-Man, will be featured, showing how double compensation design provides bending stress-relief of the outer plies when flexing around pulleys and over idler rollers. Also to be featured will be the Poly-V power transmission drive which consists of a new type belt with specially designed pulleys to mate with the parallel ribs in the belt.

■ **RED JACKET CO., INC.**

Plans to show a four-in. valve in operation and to introduce a new type of sleeve that is good for high abrasion conditions.

■ **REES BLOW PIPE MANUFACTURING CO.**

Exhibit will consist of several large portfolios showing the Rees line of dust arrestors and power shovel cab air filtering units.

■ **RIDLEY & CO., INC.**

Description not available.

■ **ROCK PRODUCTS**
MACLEAN-HUNTER PUBLISHING CORP.

Will emphasize features of its magazine.

■ **ROEBLING'S SONS DIVISION, JOHN A.**
THE COLORADO FUEL & IRON CORP.

Wire rope will be highlighted in the exhibit. Included among the display of typical wire ropes for mining uses will be a section of wire rope with electrical conductors in the core, suitable for maintaining telephone communication.

■ **SANFORD-DAY IRON WORKS, INC.**

The company will show its Model No. TL 5.5 Transloader, a model of a drop bottom car, and a model of a Granby car.

■ **SCHRAMM, INC.**

Two new drilling rigs will be on display. Both units are designed for one man operation, being self-propelled and self-contained. The Model C-42 Rotadrill is powered by hydraulics, concentrating its entire air output in the hole. The Deluxe Pneumafeed consists of a boom on which is mounted a pneumatic cylinder carrying a four-in. drifter.

■ **SELBY DRILLING CORP.**

See Intrusion-Prepakt, Inc.

■ **SHAFT & DEVELOPMENT MACHINES, INC.**

See Machinery Center, Inc.

■ **SHEFFIELD DIVISION**
ARMCO STEEL CORP.

A ten-ft contemporary exhibit, containing special lighting effects, will feature the company's slogan "Used and Proved All Around the World." In addition there will be transliides of manufacturing steps, with actual samples of the company's grinding balls split to permit the inspection of the fine grain structure.

■ **SHELTON-CHENEY MINING CO.**

An outstanding feature of the exhibit will be a mill that consists of a rock crusher, concentrator and pulverator. This is all one unit that is mounted on a 1½-ton truck.

■ **SMITH TOOL CO.**

Will feature three-cutter air circulation rock bits for drilling rotary blast holes, three-cutter tungsten carbide insert bit with jet type circulation, and three-cutter air circulation bit component parts sectioned where necessary to show the flow of air through the leg and journal of the bit. Improvements in rotary mining bit design plus the latest advances in large diameter hole drilling tools will also be shown.

■ **SPENCER CHEMICAL CO.**

The exhibit will keynote the use of ammonium nitrate as a basic constituent in field-compounded blasting agents. Three main themes will be pursued: Research and development, utilization and safety, and service. Also, a pneumatic loading machine will be featured.

■ **STANDARD STEEL CORP.**

A pilot dryer specifically designed for use in making pilot plant studies will be shown. The 15-in. diam. by 8-ft unit will test dry material under a variety of flows, temperatures, and flight arrangements. It can be set up for either counter or parallel flow at both high and low temperature, and can also be adapted to use steam heated air for low temperature drying applications. A special refractory lining enables its use as a rotary kiln.

■ **STEARNS MAGNETIC PRODUCTS**

Display will highlight a new and improved Indox V wet permanent drum separator and a new Indox magnetic pulley. Both units will be full size.

■ **STEPHENS-ADAMSON MANUFACTURING CO.**

Products to be displayed include new vibrating feeder, sectional belt conveyor with exclusive S-A bent plate decking, Curve-Crown welded all steel pulley with squeeze-lock nub, holdback for conveyor or elevator, sprink-type belt cleaner, Sealmaster ball bearing units, 220 Series roller bearing carriers and 220 Series roller bearing return rollers.

■ **STOODY CO.**

Examples of a new automatic welding system now produced by the company as complete units will be exhibited. One machine will be in actual operation, applying Stoody hard-facing alloys. Also, there will be an operating exhibit of the new tooth rebuilding procedure as done by the semi-automatic welding method. Various rebuilt and hard-faced pieces of mining equipment will complete the exhibit.

■ **TELSMITH DIVISION**
BARBER-GREENE CO.

See Barber-Greene Co.

■ **THERMOID DIVISION**
H. K. PORTER CO., INC.

See Porter Co., Inc., H. K.

■ **THOR POWER TOOL CO.**

Drilling equipment to be featured includes two new three-in. bore push feed drills with single stage, power-retracted feed legs and two-stage manually retracted feed legs. Also, there will be two new sinker rock drills of the 45- and 55-lb class, with new power and handling features. Other products will include a crawler-mounted loading machine which loads under a four-ft roof and needs only 5½ ft of head room to dump, and a crawler-mounted 4½-in. drill rig with new boom and mast swing features adapted for underground drilling and with remote control of feed motor and mast.

■ **TIMKEN ROLLER BEARING CO., THE**

Highlighting the Timken exhibit will be tapered roller bearings, removable rock bits and alloy steel. In addition there will be a cutaway Timken bearing equipped mine car wheel, a cutaway heavy-duty type freight car bearing application, a conveyor tube assembly and several other mine car parts.

■ **TOOL STEEL GEAR & PINION CO.**

Cutaway sections of the various types of materials manufactured for the mining industry by the company will be shown. In each case the samples will show the depth of hardened surface and the core of the part offered for service in the mining industry.

■ **TRAYLOR ENGINEERING & MFG. DIVISION OF**
FULLER CO.

See Fuller Co.

■ **TWIN DISC CLUTCH CO.**
HYDRAULIC DIVISION

Reports it will feature "the world's largest roll bearing double universal joint." Large joints of this type are used on ore processing machines. Also to be shown will be the new Twin Disc power shift torque converter type transmission to be used in the 450-hp range. Providing five speeds forward and single speed reverse, this product is designed for use with rubber-tired vehicles such as front end loaders, scrapers and off-highway trucks. Rounding out the exhibit will be a display of various industrial type clutches.

■ **TYLER CO., THE W. S.**

Main feature of the exhibit will be the latest model Ty-Rock screen of the type used in the mining industry. Samples of woven wire screens of many different metals and meshes, along with standard screen scale testing sieves, will complete the exhibit.

■ **UNION CARBIDE NUCLEAR CO.**

Description not available.

■ **UNION WIRE ROPE CORP.**
SUBSIDIARY OF ARMCO STEEL CORP.

Will display mine machine ropes, slusher rope, Tuffy hoist lines, Tuffy dozer, and Tuffy scraper wire ropes. In addition, the 13 types of patented machine braided Tuffy slings will be on display.

■ **UNITED STATES RUBBER CO.**
MECHANICAL GOODS DIVISION

"Minimum mining maintenance" will be the theme. Display will include conveyor belting, auxiliary belting equipment, hose, packing, V-belts, flexible couplings, tape, and Useolite plastic pipe. Of special interest will be a demonstration of "U. S." Holdtite conveyor belt repair materials. Useothane materials with its wet abrasion resistance will also be exhibited.

■ **UNITED STATES STEEL CORP.**

Exhibit will be built around the theme of magic metals in mining. A magician will present a series of new and different product presentations designed to inform and entertain. The illusions he creates will be built around the some 10,000 steels available to the mining industry. Also to be demonstrated is the Lorig aligner principle for cables.

■ **UNITED STATES STEEL CORP.**
USS CHEMICALS

Use of USS ammonium nitrate in the mining industry will be featured. Exhibit includes a replica of a drill hole loaded with oil treated ammonium nitrate and photographs of its use and results. A continuous slide presentation shows step-by-step procedures followed by some mining companies in the use of field-mixed blasting agents.

■ **UNIVERSAL ENGINEERING CORP., THE**

Products to be displayed include the all new NICO feeder which features crawler tractor type chain, tractor type rollers and anti-friction bearings in the shafts. A working model of the Wobbler feeder will be in operation, and a model of a portable jaw crusher and full size three-deck horizontal Screenmaster will complete the exhibit.

■ **VAREL MANUFACTURING CO.**

A complete line of rotary drilling tools will be shown, including rock bits, blade bits and diamond bits. While the display will be centered around the mining rock bits, special mining-type tungsten carbide inserted blade bits and mining-type diamond core bits and small blasthole bits will be featured. Varel will also introduce its new concept in mining bit design—its new nine-in. VQM type.

■ **VASCOLOY-RAMET CORP.**

Plans to have a complete line of V-R carbide tipped rock bits on display. A new series of carbide tipped throwaway bits developed especially for the New Mexico uranium field will be featured along with other new developments in down-the-hole bits.

■ **VICTAULIC COMPANY OF AMERICA**

A complete line of company products for the mining industry will be exhibited, including standard, lightweight and Snap-Joint couplings, and fittings for grooved end pipe. In addition, fittings of aluminum, stainless, plastic, rigid plastisol lined and other lined fittings will be shown. Featured will be Victaulic's Plainlock method of piping, couplings and fittings, for connection of plain end pipe with no end preparation required. Grooving tools for both standard and light wall pipe, lubricated plug valves, and other accessories will also be displayed.

■ **VULCAN IRON WORKS CO., THE**

Will feature an operating model of a semiautomatic hoist designed for production duty in small mines and service duty for all mines. A bottom-dump skip-cage unit will be operating with the hoist. In addition, operating models of the Zimmerman-type timber and material cages will be on display. Models with integral trucks and separate trucks will be shown. The trucks will have steel and rubber-tired wheels.

■ **WAGNER MINING SCOOP, INC.**

Description not available.

■ **WEMCO**
A DIVISION OF WESTERN MACHINERY CO.

Plans to show a working model of the Wemco-Kraut Jet Jig, a pneumatically actuated diaphragm-type unit, developed for separation of particles too fine for H.M.S. and

too coarse for concentration by flotation. Photographs and films will be used to illustrate the Wemco-Siebtechnik dryer, a horizontally mounted screen-type centrifuge; dense media separation equipment and WEMCO-Remer Jigs.

■ ***WERCO STEEL CO.***

Exhibit will feature the Tornado impact crusher which is manufactured in four sizes—3 ft, 4½ ft, 5 ft and 6 ft. Feed sizes range from mesh sizes to eight in.

■ ***WESTERN CONTRACTING CORP.***

An open pit stripping and mining contractor, Western Contracting Corp. will exhibit one semitrailer end dump truck currently used in its operations. The 80-yd hauling unit is powered by two diesel engines developing a total of 850 hp, driving through two four-speed transmissions. The entire unit is 55 ft long, 16 ft wide and 15 ft high, and is capable of hauling a 150-ton payload at 35 mph.

■ ***WESTERN ROCK BIT MANUFACTURING CO.***

A wide variety of percussion drill bits will be displayed. The exhibit will include both "used to destruction" steel bits and "used to destruction" carbide insert bits. There will also be on display the new five-hole Tee Cee and steel bits for vacuum type drills.

■ ***WESTINGHOUSE ELECTRIC CORP.***

Will show the latest a-c and d-c motors and gearmotors applicable to the mining industry. Other features include Load-O-Matic crane hoist control and an actual standardized portable switchouse for open pit mining.

■ ***WHEELABRATOR CORP.***

Featured will be the extensive list of applications for Wheelabrator cloth tube-type dust and fume collectors. An operating model will be displayed to demonstrate the principle of repressuring to release collected materials from the interior surfaces of glass fiber filter tubes. In addition, there will be a complete exhibit of the various types of cloths and synthetic fabrics available for cloth filtration, with emphasis on the physical characteristics, applications, and advantages of each.

■ ***WILLYS MOTORS, INC.***

Exhibit will be built around two vehicles, one the Forward Control Model FC-170 pick-up truck and the other a Jeep Universal CJ-5. Along with the vehicles some items of appropriate special equipment will also be shown.

■ ***WINK CORP.***

Will demonstrate the Bucyrus-Erie Winkie diamond core drill.

1960 Mining Show Sponsors

(Not exhibiting, but actively supporting the Mining Show)

Allen-Sherman-Hoff Pump Co.
Anaconda Wire & Cable Co.
Athey Products Corp.
Atlas Steel Limited
Automobiles M. Berliet
J. G. Blount Co.
David Brown, Inc.
Canadian Industries Limited
Carpco Manufacturing, Inc.
Denver Equipment Co.
Diamond Tool Research Co., Inc.
Thomas A. Edison Industries, McGraw-Edison Co., Storage Battery Division
Federal-Mogul Service
Firestone Tire & Rubber Co.
Flexible Tubing Corp.
Flexonics Corp.
The Geodimeter Co.
Irwin-Sensenich Corp.
Koehler Manufacturing Co.
Koehring Co. Koehring Division Buffalo-Springfield Co.
Manning, Maxwell & Moore, Inc.
McDowell Co. Inc.
Merrick Scale Manufacturing Co.
Mobile Drilling, Inc.
Monsanto Chemical Co.
Nolan Co.
The Okonite Co.
Ore & Chemical Corp.
Peterson Filters & Engineering Co.
Radio Corporation of America
Southwestern Engineering Co.
Sprague & Henwood, Inc.
Taylor-Wharton Co. Division of Harsco Corp.
Texaco, Inc.
Unit Rig & Equipment Co.
Western Gear Corp.

(Continued from page 35)

Post-Convention Trips Planned

On the day following the convention, Friday, October 14, two special trips have been arranged to give mining men an opportunity to visit some of the Nation's foremost mining operations.

One group will visit the Nevada Mines Division operations of Kennecott Copper Corp. at Ely. They will leave Las Vegas at 8:30 A.M. and fly by chartered plane 230 miles north to Ely. On arrival they will inspect the mining operations at Ruth, where 21,000 tpd of ore and 45,000 tpd of waste are handled. Returning to Ely, the group will be luncheon guests of the community and Kennecott Copper Corp., after which the mill and smelter at the McGill reduction plant will be visited. The special plane will leave Ely at 4:00 P.M. and arrive Las Vegas at 5:00 P.M. Anyone who wishes to continue his trip directly east or west from Ely may stop overnight as a guest of the Nevada Hotel.

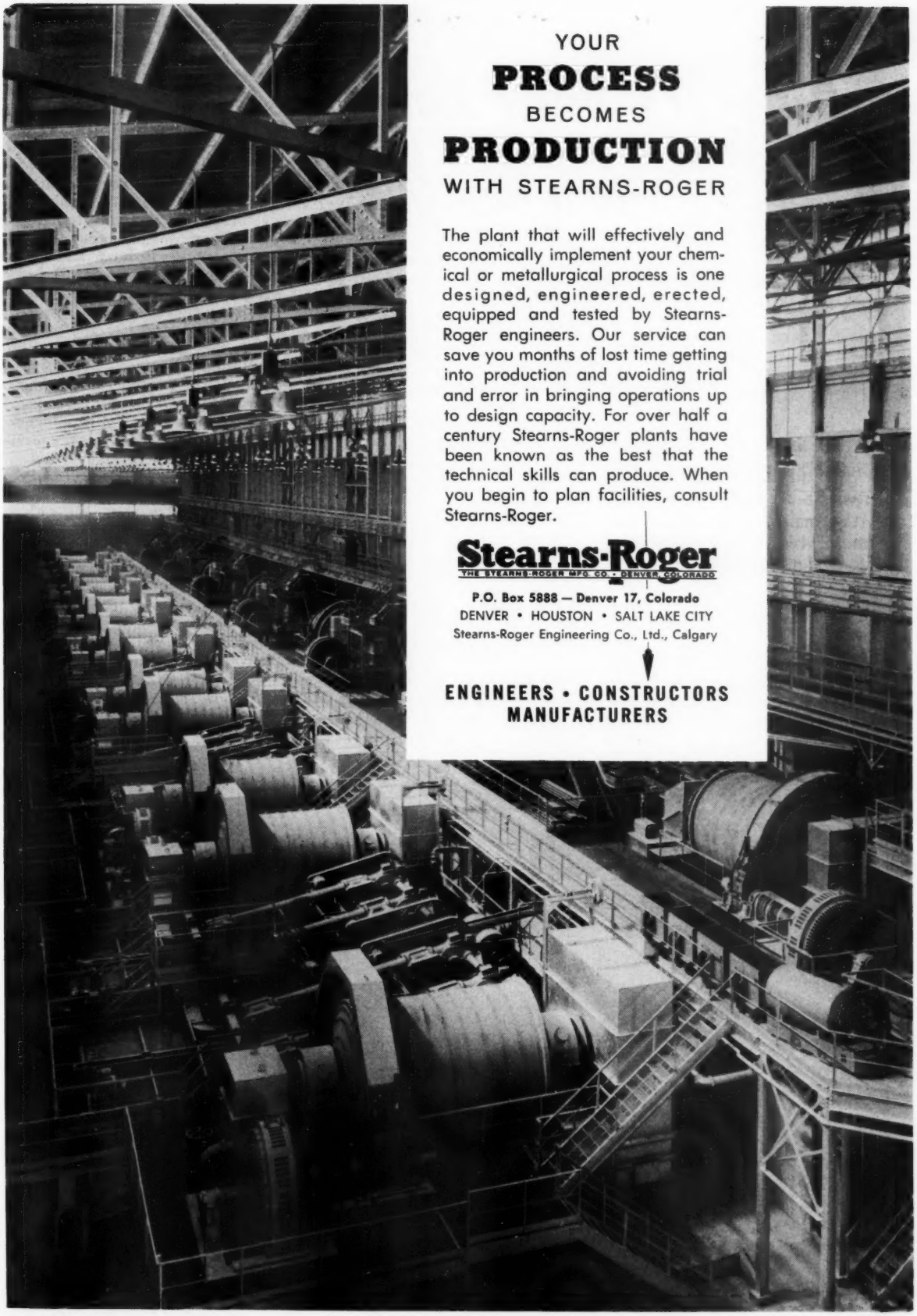
The second group, on a trip for men only, will board buses in Las Vegas at 8:00 A.M. A visit to the Apex plant of U. S. Lime Products Division, including a tour of the kiln plant and quarry, will be followed by a trip to Henderson's Basic Management, Inc. Here the Stauffer Chemical, American Potash & Chemical and Titanium Metals plants will be seen. After a barbecue lunch at Blue Diamond, the open-pit mine, plaster mill and wallboard plant of Blue Diamond Co., division of The Flintkote Co. will be visited. The group will return to Las Vegas about 5:00 P.M.

Don't Miss It

All in all, an exceptional program of general and operating sessions has been arranged in which many of the top men in Government and industry will take part. This together with the exposition of latest developments in mining and processing machinery and supplies, the entertainment, the field trips, and the famous hospitality of the West, will make the 1960 Mining Show another significant contribution to the industry's progress.

Mining companies are sending increasing numbers of their key production and operating personnel to the Mining Show as a "refresher course" in mining techniques and equipment. Aggressive competition on all sides demands greater productivity and safety in the Nation's mines. What better opportunity exists to find out about the best equipment for your job, or to learn how others are solving their problems, than by attending the 1960 Metal Mining and Industrial Minerals Convention-Exposition of the American Mining Congress?

Anyone who does not yet have a hotel reservation should send his request for accommodations immediately to the Las Vegas Convention Bureau, Paradise Road, Las Vegas, Nevada.



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ENGINEERS • CONSTRUCTORS
MANUFACTURERS

Design of a Power System for a New Mine

By F. G. HAMNER
System Planning Engineer
Southern Services, Inc.

A "behind the scenes" report on why a-c power was adopted as the main power supply system for two new underground coal mines in Alabama

THE Southern Electric Generating Co., or SEGCO as it is generally referred to, is opening two new bituminous coal mines in Alabama. SEGCO is jointly owned by Alabama Power Co. and Georgia Power Co. The coal reserves are owned by SEGCO.

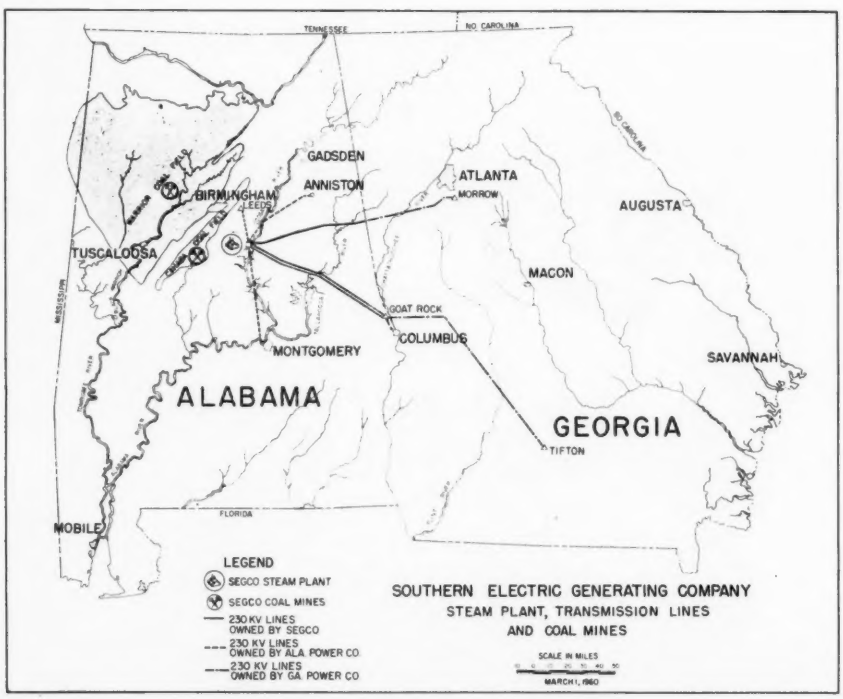
Annual Output of Two Mines will be 2,000,000 Tons

The two mines being developed are expected to yield approximately 2,000,000 tons of coal annually.

Mine No. 1 is located in the Warrior coal field about 40 miles northwest of Birmingham, Ala. It is being opened in the Mary Lee seam through a slope and two shafts. Depth of the overburden is approximately 400 ft and the seam for the most part varies from four to six ft; however, there are some thin coal areas that will be developed later by low-vein equipment. An excellent steam coal, it will be shipped approximately 120 miles by rail to the SEGCO No. 1 power plant at Wilsonville.

Mine No. 2 is located in Shelby County near Maylene, Ala., approximately 25 miles south of Birmingham. It is being developed in the Montevallo seam in the Cahaba coal field and will supplement the production of the company's Mine No. 1 in Walker County. This mine will have an ultimate capacity of 500,000 tons per year.

In contrast to the relatively flat coal beds of Walker County, the Shelby County coal measures are generally dipping in nature. The Montevallo seam can be roughly described as being bowl shaped, relatively flat in the bottom and turned up at the edges. The seam is being attacked at the edge of the bowl, and worked down toward the bottom. The pitch at the outcrop is



Map shows location of Mine No. 1 in the Warrior coal field and Mine No. 2 in the Cahaba field

approximately 12°. As development progresses toward the basin, these grades will decrease and more nearly level conditions will be encountered with an average cover of from 500 to 600 ft.

The Montevallo coal has over 14,000 Btu per lb and a rail haulage distance of only 35 miles from Wilsonville as contrasted with the Mary Lee coal at Mine No. 1 with 12,500 Btu per lb and a rail haul of 120 miles.

Mine No. 2 at this date is considered to be experimental in that there is not conclusive evidence that its full production can be economically realized. The general principles insofar as the electrical systems of the two mines are concerned are substantially identical so that this article will confine itself to a description of the electrical layout of Mine No. 1 which today is well organized and soon will be producing at a rate of 1,500,000 tons annually.

The entire output of the two mines will be used at the Wilsonville generating plant of SEGCO. This plant is designed for an initial installation of four 250,000-kw units, two of which are in commercial operation, while the third and fourth units will be in service in April 1961 and 1962 respectively.

Studies Favor Use of A-C Power

When a final decision was reached to open the mines, the eventual question of whether to supply them with d-c or a-c power arose. At that time neither the Federal Bureau of Mines nor the Underground Power Committee of the American Mining Congress had made recommendations or regulations pertaining to the use of a-c in underground operations. The mining code of Alabama, fortunately, is a well considered document and its authors must have been inspired to draft such a code so that it would cover the requirements of yesterday and yet be amenable to the adoption of new developments as the art of the industry progressed. Many good technical papers on the subject of a-c power underground were available and after a thorough research and study of all such literature, company engineers prepared a report to the management of SEGCO for their consideration in which it was recommended that a-c power be adopted as the main power supply system for the new mines. SEGCO was, moreover, fortunate in having as its advisor Dr. Milton H. Fies and his long experienced and competent staff. While the final decision to use a-c power was jointly concurred in by all responsible parties, it was Dr. Fies who initiated and followed the necessary studies so that the proper decision could be made.

The long experience of the authors of the many technical articles backing up the decision are likewise well known and properly they should be acknowledged as the guiding lights which illuminated the path which SEGCO followed.

While this article purports to describe the electrical system, it is in order to outline the several steps which were taken once the decision to use a-c power was made.

The first of these was to prepare a single line diagram of the contemplated system on which was indicated the exact nature of the types of underground transformers, circuit breaker centers, disconnecting devices, protective schemes, grounding, and the types of cable supplying the system. Next were called into conference the principals of the Federal Bureau of Mines and the engineers of the Alabama Industrial Relations Department (Mining Safety Section). In a joint session with these engineers, the engineers of SEGCO described their intentions and accepted the amendments and improvements offered either because of the advantages to be had or to bring the proposed plan into harmony with the safety requirements of the two ruling groups. In this respect it is pleasant to report that in no instance did the final design of any element in the system fall short of the recommended practices of either the State or Federal group. Actually, the safety features adopted in many cases go beyond what might have been acceptable even though this involved extra cost.

Alabama By-Products Chosen to Operate Mine

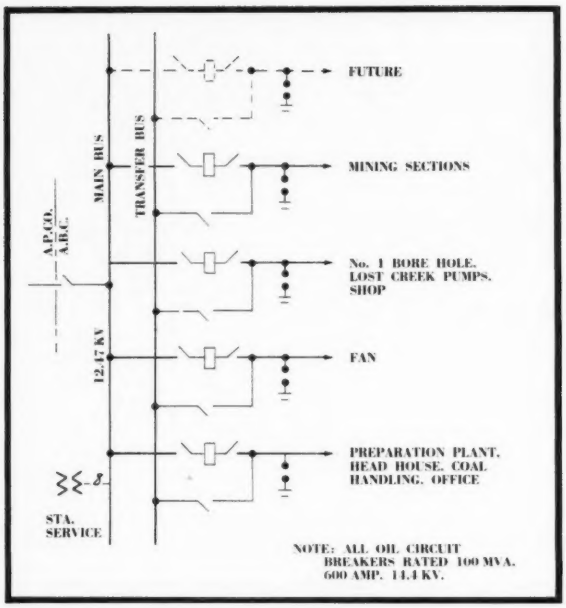
Following the general approval of the typical schemes by the Federal and State Bureaus, an agreement was reached with one of the oldest and most reputable coal operators in the Birmingham area to operate the mine.

The Alabama By-Products Co., long known for its competence and success in the mining industry in Alabama, was chosen to construct and operate the mine as agents for SEGCO.

The long experience of the engineers of Alabama By-Products entitled their opinions to be given great consideration in SEGCO finally agreeing to use a-c power. Previously, their experience had been with d-c equipment. They were familiar with this equipment and knew what it would cost, how it would perform, and what it would take to keep it well maintained. The a-c equipment was a big question mark and, as bespeaks the care of competent engineers, they, too, studied the many technical papers on the subject and attended meetings of the AMC Underground Power Committee. Also, its engineers visited mines throughout the country. This



A 1,500,000 ton-per-year coal operation is pioneering the use of a-c power in underground mines in Alabama



Single line diagram of switching station for Mine No. 1

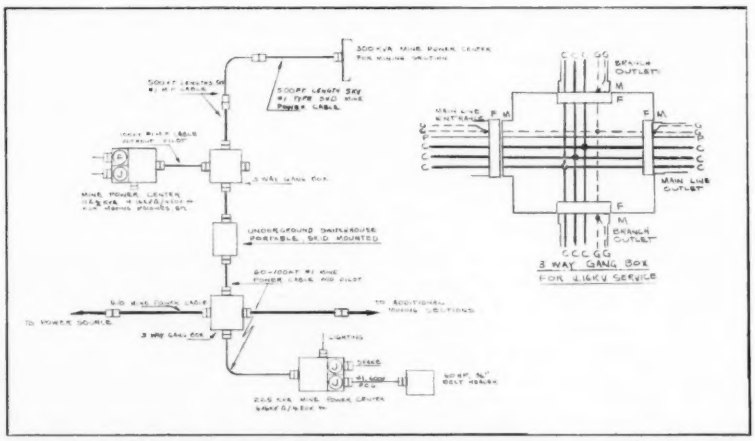
information is included because such details as the foregoing have actually been asked of the writer more often than have been questions pertaining to the electrical system itself. Perhaps the plans leading to the acceptance of a-c is as important as the system itself.

With the agreement of Alabama By-Products to accept the a-c equipment, the engineering staffs of SEGCO and ABC held frequent discussions among themselves and with the manufacturers to arrive at a final set of specifications for each component of the finished electrical plant.

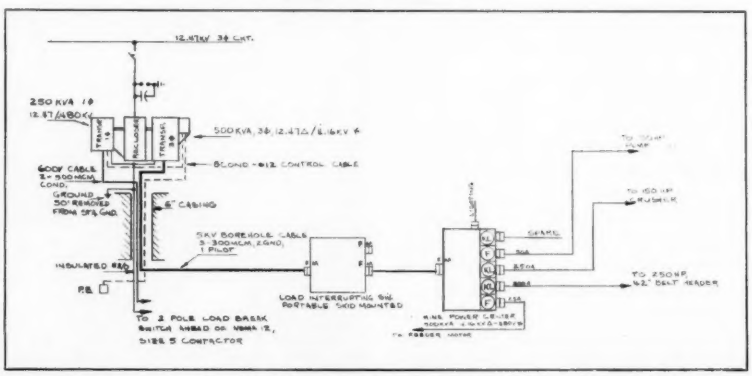
System is Consistent with Accepted Good Practice

In general, the underground power system is identical with that proposed by the AMC Underground Power Committee and as recommended by the Federal Bureau of Mines. Indeed, so complete and adequate are these recommendations that a novice could order equipment by merely specifying that it should be in accordance with these recommendations. Where the design of the electrical systems of the SEGCO mines differs, it is in the nature of something additional rather than a deficiency. It is not out of place at this time to compliment the Federal Bureau on its accomplishment and urge the serious study of its recommendations by anyone contemplating an a-c power system. Coal, as any other commodity, has many competitors and the industry is outstanding in its willingness to adopt new methods to meet that competition. More than anything else, this attitude assures the coal industry a bright future, and that soon.

The main power supply is from Alabama Power Co. at 46,000 volts. This is stepped down to 12,470 volts, grounded wye in the power company's substation. One metered circuit extends to the mine substation. Here check metering is installed along with a station service transformer and five outgoing 12-kv feeder breakers. No voltage regulators are installed at present but space is provided for their possible future use. Each breaker is provided with phase overload and a ground relay. Lightning arresters are installed on each outgoing circuit. Meters are provided to permit a check on individual feeder loads. These breakers are the outdoor type with isolating and by-pass disconnecting switches. Metal clad switchgear was contemplated but not purchased because of the poorer performance record the power companies have had with this type of equipment as compared with the conventional outdoor oil circuit breakers. Each breaker is rated 14.4 kv, 600 amp, 100,000 kva interrupting capacity. They are electrically operated from the station service transformer through a dry



A typical 4160-volt underground distribution system. Power centers are usually 225, 300 or 500-kva skid-mounted units



Electrical layout for borehole No. 1 which handles the feeder, crusher, belt header and pump

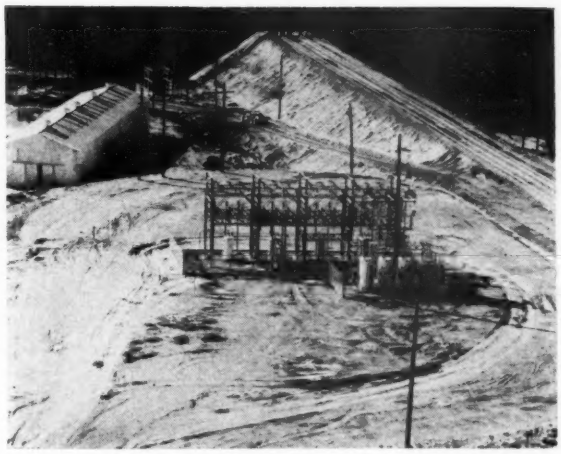
type rectifier and a solenoid closing mechanism. Tripping is by means of capacitor devices.

4160 Volts Adopted for Underground Supply

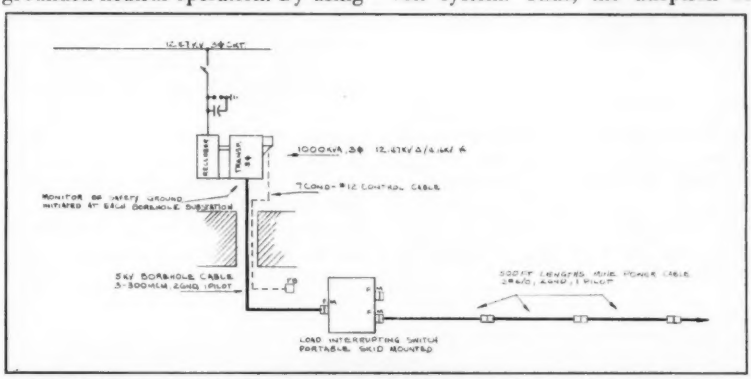
Overhead feeders are of the woodpole type construction with the neutral wire carried overhead for lightning protection. Those supplying outdoor and above ground transformers are separate from the underground circuits. Power is stepped down directly to 440 volts delta for all above ground uses. Motors are equipped with conventional starters of ordinary type. Such substations are of the permanent type.

Underground feeders are supplied at 4160 volts grounded wye. At the top of the borehole a three-phase transformer rated 12,470–4160Y volts is mounted on fabricated steel skids which will permit the unit to be readily moved to new locations when necessary.

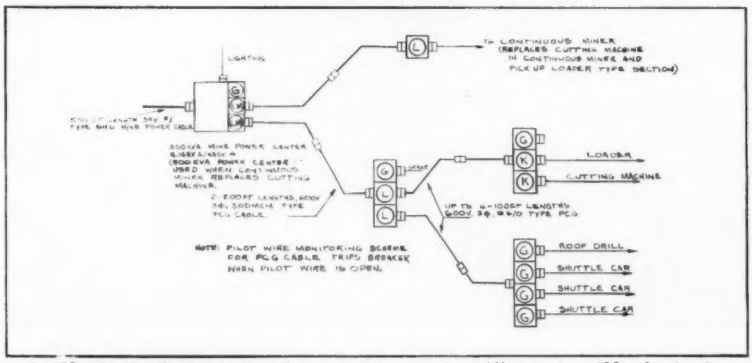
Use of 4160 volts as the underground supply has raised many comments, but there is a short quick answer to be given. It was not felt that any cable connector on the market was suitable for 12,000 volts grounded neutral operation. By using 4160 volts in combination with the 12,000-volt primary supply, an overall saving in cost and losses was effected. The long 12-kv circuits can be built with small conductors and a borehole transformer provided at less cost than could 4160 volts be distributed with heavy copper and larger voltage drops and power losses. The 4160 volts was adopted because several engineers were reluctant to risk the 7500-volt connectors on a 7200-volt system. Thus, the adoption of 4160 volts was a compromise in the interest of safety, and reliability, and because it was less costly than 12 kv. Actually 7.2 kv would probably have been a good voltage to adopt but already many innovations have been incorporated and this one concession to caution is not important, money-wise.



The main power supply is from Alabama Power Co. at 46,000 volts. This is stepped down to 12,470 volts, grounded wye, in the power company's substation. One metered circuit extends to the mine substation, where check metering is installed along with a station service transformer and five outgoing 12-kv feeder breakers



Typical 4.16-kv borehole. The three-phase transformer at the top of the borehole is mounted on fabricated steel skids to permit the unit to be readily moved to new locations when necessary



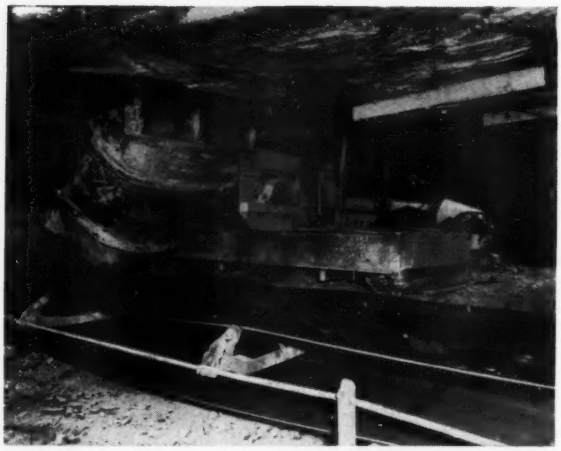
A 480-volt distribution system for one mining section. All outgoing 480-volt circuits are equipped with overload elements and safety ground trip devices

Electrical Set-Up for Grizzly Feeder is Unusual

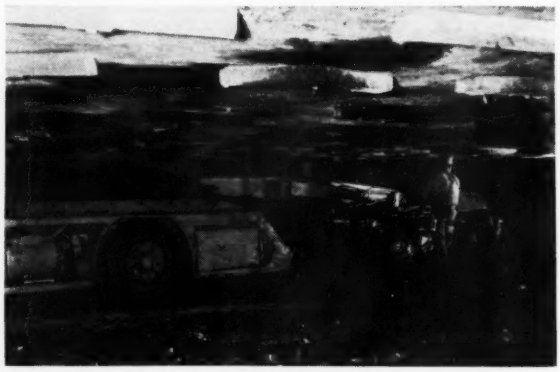
The single line diagrams accompanying this article are readily understood and there need be little space spent in a detailed description of each element of the system. Suffice to say that the system is consistent with or exceeds the recent conclusions of the AMC Underground Power Committee and the recommendations of the Federal Bureau of Mines. At the bottom of each borehole is the required disconnecting devices, etc. The power centers are usually either 225, 300 or 500 kva, skid mounted.

Visible disconnecting devices are provided on the high side of each power center. All outgoing 480-volt circuits are equipped with overload elements and safety ground trip devices. Type PCG cable is used up to the last disconnecting device where type G trailing cable takes off to the machines or shuttle cars.

Perhaps one of the most interesting features of the electrical system is the manner in which single phase a-c current is provided to work in series with the d-c generator used in the operation of a grizzly feeder under the underground surge bin. A 15-kw d-c generator is required for the six coils of the vibrators and a 250-kva 440-volt transformer works in the same circuit. This transformer is mounted at the top of the borehole and is equipped with a single-phase



A belt system brings the coal from various sections of the mine to the main haulage belt and thence to the surface



All equipment within the mine is a-c except a d-c trolley system for hauling supplies

circuit breaker on the high side. A throat connection is provided direct from the 12-kv bus which also supplies the 500-kva three-phase transformer for 4160-volt supply to the feeder, crusher and 42-in. belt. The two a-c secondary leads are carried in the same borehole from whence it is led to the vibrators. Supplying this equipment presented a real problem since it is not advisable to put a 250-kva single-phase load with a heavy d-c component on any phase of a comparatively small three-phase transformer. Getting a primary supply to such a size transformer underground would have required 12 kv which was not intended for underground use or four kv which would have had to be taken from another transformer and hence would have put a heavy single-phase load on a three-phase transformer. The engineers are proud of this solution and its novelty has appealed to many who have made inquiries about it.

Belts Haul Coal, D-C Trolley System Handles Supplies

All equipment within the mine is a-c power operated except that a d-c trolley system is provided for hauling supplies underground. There seems to be no practical a-c trolley system available. The plans call for extending the rail system with time. Battery-operated tractor cars will carry materials from the main line of supply to locations where needed.

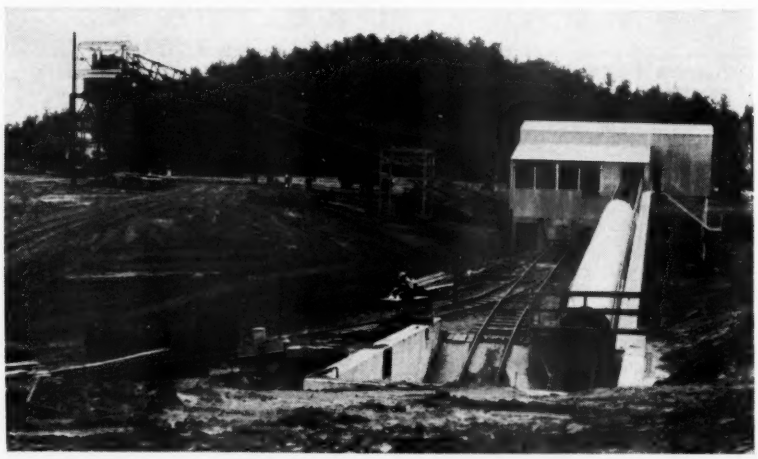
Supplying the d-c trolley system is a 150-kw silicone rectifier mounted on skids to permit easy relocation as the track is extended in length. A four kv primary supplies the rectifier transformers. Output voltage is 275 with control for adjustment.

A belt system brings the coal from various sections of the mine to the main haulage belt and thence to the surface. The coal is crushed underground to size and then transported to the preparation plant on belts where it is washed and loaded directly into rail cars or trucks.

Except for the shuttle cars, all machines are powered by induction single-speed motors with standardized control. The shuttle cars have two speeds obtained by varying the number of poles by a factor of two. This not only provides good starting torque and a low speed, but also allows a good rate of travel on grades even when fully loaded.

Safety Stressed

The ground fault trip devices now standard with a-c power systems in mines is probably one of the greatest contributions to safety imaginable. A small current flowing through the two insulated pilot wires in a type PCG 600-volt secondary cable allows such monitoring of the circuit that will cause the feeder breaker to trip instantly should the pilot connection be broken and also, the safety neutral ground will allow but a small amount of current to flow in the ground in case a cable phase conductor should fail to ground. This small current flowing thru the resistance of the ground resistor and cable will produce only a small 50-volt surge at the machine



Head house (right) contains the conveyor drive and slope hoist. The rock belt and bin (left) is being used temporarily for development coal disposal. The entire output of this mine will be used at the Wilsonville generating plant of SEGCO

when a fault occurs. Thus the workmen attached to the machine will receive only a slight shock. Of importance too is the fact that the small current will cause little or no burning of the copper when a fault develops. In the d-c system such a fault would result in heavy currents and blinding arcs enduring for a substantial time. Not only is the cable badly burned at the point of the fault, but with heavy short-circuit currents the entire cable could well be destroyed.

All primary cables are provided with a safety ground and pilot wire system which is continuously monitored. Should the pilot or ground conductor be broken, or if a high voltage connector is accidentally separated, the circuit involved is de-energized within a few cycles after the pilot wire contacts are separated, and before the phase contacts are exposed. A resistor limits phase to ground fault current to approximately 25 amp. The high voltage cable safety ground monitoring scheme is initiated at each 4160-volt borehole.

Where overhead circuits enter a borehole or building, lightning protection is applied which is far more adequate than a mere arrester; at such points a suitable capacitor is installed with the arrester. This combination of arrester and capacitor has long been in use by public utilities in their generator protective scheme and its effectiveness is well substantiated by experience.

No. 1 mine is now accumulating records which will be available at some future date. They are not complete enough to permit drawing any conclusions from them as to power costs, maintenance expense, downtime, etc. Only after a substantial period of operation will such data be had in quantity from which conclusions can be drawn on the economical aspects of a-c power.

ACKNOWLEDGEMENTS

Appreciation is expressed to the many authors of technical papers on a-c power mining and to Messrs. L. H. Harrison and C. L. Brown of the Federal Bureau of Mines.

Messrs. H. T. Williams and Robert Perry of the Alabama Industrial Bureau (Mining Section) were first called into conference and their early acceptance of the idea of a-c power made it possible to continue.

J. F. Crist, president, A. E. Burnett, vice president and J. E. Brown, Jr., manager of Coal Operations of SEGCO, early recognized the value of a-c power and stand with Dr. Fies in pioneering this innovation in Alabama.

The Alabama By-Products Company's Messrs. Henry Hager, G. C. Dyar and R. J. Miller have made the actual operation of the a-c mine possible and been most helpful in the preparation of this article.

Roof Control

Recovery of Roof Bolts*

The development of the suspension method of roof support in coal mines contributed greatly to the rapid development and expanded use of mechanical loaders and continuous miners. By eliminating entirely, or greatly reducing, the number of posts required, suspension support provided for wider, unobstructed, work areas. Such areas permitted machines of increased size, capacity, and maneuverability to be introduced in mines.

At first, roof bolts were anchored in the overlying strata by slotting the rod and driving it up in the strata over an iron wedge, and then applying the proper tension to the bolt by tightening a nut on the lower threaded end of the rod. Bearing plates of steel, of various sizes, were used, many times together with wooden pieces that would provide more area protection.

After much experimenting with various methods of bolt anchorage, the expansion shell method was adopted. Since this roof bolting method is expensive, mines started to recover and re-use roof bolts in an effort to reduce the cost.

Roof bolt recovery can be either a very hazardous or a relatively safe operation depending upon how the job is done. Experience in recovery methods, and the accidents that occurred through their use, has led to the development of practical and safe procedures to accomplish this job. The following safe procedures are recommended:

1. **Recovery machines should be used in preference to other methods. These should be equipped with remote controls.**
2. **Capable, cautious, and experienced miners should be selected for this work.**
3. **Men should work in teams of two (excluding transportation men).**
4. **Roof bolt recovery should follow a definite plan. The plan should require that adequate temporary support be utilized during the recovery operation. A minimum requirement is four safety jacks set between the workmen and the area from which bolts are being removed.**
5. **The jacks being used in recovery work should be of the type that can be tripped and retrieved by workmen under supported roof.**
6. **Bolt recovery generally should begin near face areas and retreat outward.**
7. **When heavy or questionable roof is encountered, bolts should be left intact and bypassed until an area is reached that careful testing indicates the bolts to be not loaded and, therefore available for safe recovery.**
8. **All areas from which roof bolts have been recovered should be properly "dangered off."**

** Prepared by the Advisory Committee 1960 National Campaign to Prevent Injuries From Roof Falls in Coal Mines.*

The Electric Wheel Drive in Mining

By EDWARD R. BORCHERDT
Borcherdt & Smith, Mining Consultants

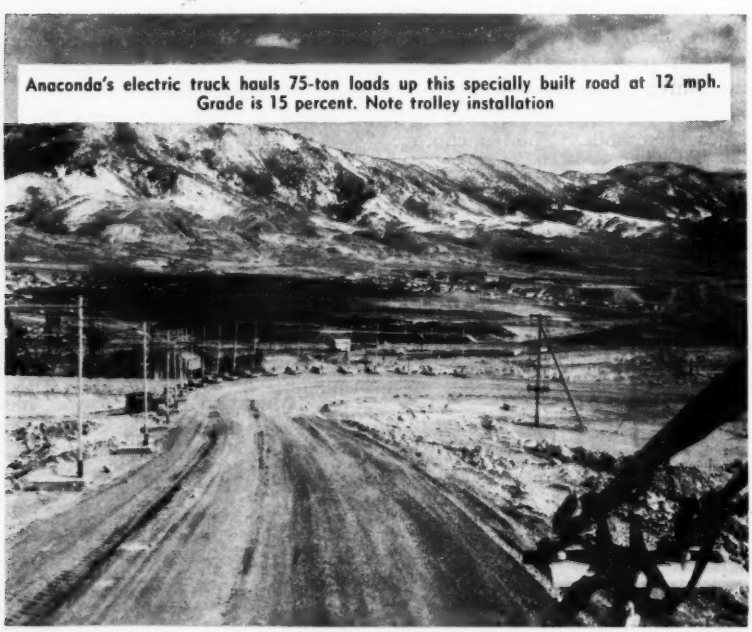
The Anaconda Company's conception of an electric truck was one which would have performance characteristics far above anything obtainable with the most powerful diesel haulage unit

THE first application of the electric or motorized wheel to a modern, off-highway, haulage truck is less than a year old. Of interest is the fact that much of its early development was done by two manufacturers—the General Electric Co. and R. G. LeTourneau—both of whom, working with the military independently and at different times, had the same idea of using the electric wheel to power a military transport unit which required great flotation ability for transportation on snow. In this case, very large tires were required, affording ample room in which to install the powerful electric motors. The hubs of the four driven wheels were utilized for the sun and planet drive gears.

During the early 1950's a military requirement to move heavy loads quickly over Arctic snow terrain was successfully met by a train of these motor-wheeled units designed and built by R. G. LeTourneau. Later in the 1950's LeTourneau adapted the electric wheel to massive log handling equipment for which he constructed tire molds and had built by the Firestone Co., for his account, the first of the so-called Jumbo tires.

In the meantime General Electric constructed a set of four electric wheels of a design differing from LeTourneau's which were installed in a four-wheel-powered carryall scraper by Caterpillar Co. in which power was derived from a diesel generator unit.

In 1953 LeTourneau sold his earth moving equipment manufacturing business to Westinghouse Airbrake Co. and signed an agreement to remain out of this field for a period of five years. His re-entry into the business in May 1958 was with the construction of a large 50-yd carryall scraper driven by four electric wheels and motivated by a generator powered by a 600-hp Cummins diesel engine.



Anaconda's electric truck hauls 75-ton loads up this specially built road at 12 mph. Grade is 15 percent. Note trolley installation

Anaconda Explores Idea of Electric Truck

Some time prior to this, the Anaconda Company's research people, searching for a means of reducing the high maintenance cost of open pit haulage trucks, explored the idea of an electric truck powered through a trolley. It was known that a practical, electrically operated, trolley-battery truck haulage system was in operation at the International Salt Company's mine under the city of Dearborn, Mich., so that it was not much of a mental feat to combine this idea with that of the motorized wheel.

About this time Kenworth Co. constructed three 30-ton trucks for Riverside Cement Co. in which the diesel engines were substituted by a 350-hp d-c electric traction motor driving the rear wheels through a propeller shaft to the rear axle.

Anaconda's conception of an electric truck was one which would have performance characteristics far above anything obtainable with the most powerful available diesel engine operated trucks. It should carry a larger load, on a steeper grade and at a

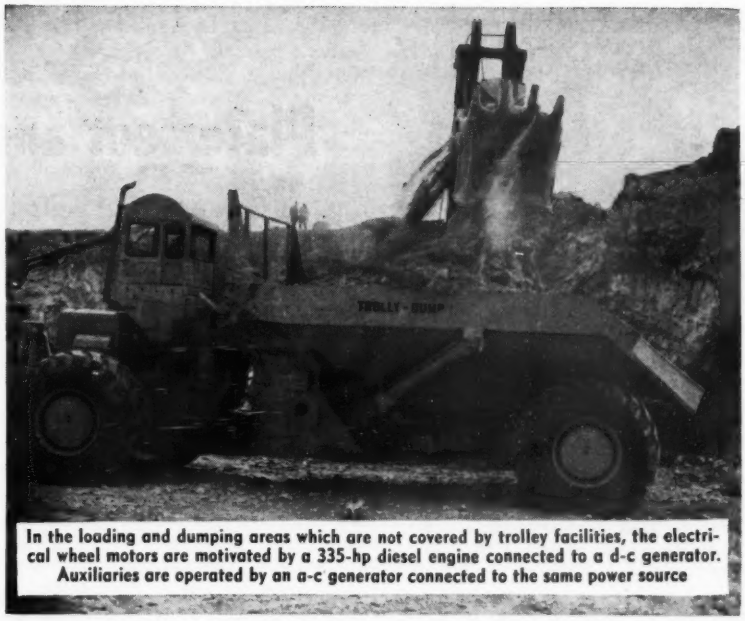
higher speed than had heretofore been attempted with conventional equipment. In fact it was hoped that the load capacity might be doubled, that the negotiable grade might be doubled and finally, that the speed on those grades might be doubled. It was further desired that the unit be automated and that maintenance costs should be materially lower. Because the power requirement for this unit would be greatly in excess of available diesel power equipment, consideration was limited to electric drive powered through a trolley. High availability is high on the requirement list.

Early last year C. E. Weed, chairman of Anaconda, authorized the construction of a prototype electric wheel, trolley-powered truck, and shortly thereafter an arrangement for its construction was made with R. G. LeTourneau Co., Inc. of Longview, Tex. The unit was completed in June 1959 and after extensive testing in Texas with loads up to 110 tons, it was partially disassembled and loaded upon three railroad flat cars for shipment to the Berkeley Pit in Butte, Mont. Unfortunately, a mine strike occurred before the shipment reached Butte and delayed the operation of the truck for almost eight months.

Potential of Unit Yet to be Determined

Much data will be required to evaluate the capabilities of this truck during the next 10 or 12 months. Determination of the most efficient loads, most efficient grades, speeds and power requirements will be made, and maintenance costs will be closely investigated. Tire costs and power supply costs will be critical considerations.

Anaconda hopes to demonstrate that this truck will permit the economical operation of deeper open pits than are now practical, and that it will permit pit lay-out to conform more closely to the shape of the ore body, resulting in greatly reduced stripping ratios. For example, iron ore bodies in northern Sweden are frequently long and narrow which with conventional equipment require the excavation of large amounts of waste to provide road ways of proper grade for efficient operation of diesel trucks. In other words, instead of spiraling out of a pit on a maximum seven percent grade with conventional equipment, an electric truck will negotiate 15 to 20 percent grades at comparatively high speeds on a straight line exit ramp with the later addition of turns as required.



In the loading and dumping areas which are not covered by trolley facilities, the electrical wheel motors are motivated by a 335-hp diesel engine connected to a d-c generator. Auxiliaries are operated by an a-c generator connected to the same power source

The company also hopes to demonstrate the truck's value in reducing haulage distances now required for waste disposal. For example, at Anaconda's Chuquicamata operation, long railroad waste disposal hauls can be abandoned in favor of steep, perhaps 15 percent, waste dumps, constructed close to the pit on top of former dumps.

In certain open pit operations in remote areas such as central Africa, it is felt that electric truck transportation will have a great economic advantage over diesel trucks where cheap power is available, and particularly where the transportation of fuel thousands of miles over narrow-gauge railroads is now required.

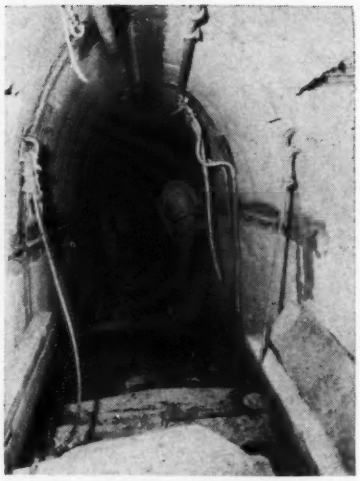
Tire Costs May Govern Economic Load Limits

Anaconda expects to determine economic load limits which it believes will be governed to a large extent by tire prices. Tires now available in the 44.5–45 size are approximately ten ft in diameter and weigh almost three tons each. The recommended loading per tire in this size with 68-ply rating and inflated to 70 psi is 95,550 lb at 30 mph or 107,010 lb at ten mph. These tires sell for about $7000 each so it is apparent that maximum ultimate service hours and maximum number of recaps are of vital interest.

(Continued on page 72)



Anaconda hopes to demonstrate that the electric wheel truck will permit the economical operation of deeper open pits than are now practical



Section of concrete grizzly drift in a gravity block. A chute tapper is pulling ore through grizzles in the background

Placement and Use of Concrete Underground

By C. L. PILLAR,
Mine Superintendent
San Manuel Copper Corp.

USE of monolithic concrete for the support of underground openings is not new. It has been common practice in tunnel work for many years, and has also been used in underground mining operations for a long period of time but confined mainly to permanent shafts and stations where long life and service were anticipated. Mine operators have long recognized the many advantages of concrete ground support; however, the relatively high initial expense of such support has, in the past, made it economically unfeasible for underground mining operations except in particularly favorable situations.

Concrete Competitive With Timber and Steel

Today the initial cost of placing large-scale underground concrete support has become economically competitive with the placing of heavy types of timber and steel support. This is due to the inflationary rises in the prices of timber and steel, which have not been paralleled by cement and concrete aggregates, and the use of newly developed equipment and techniques which allow a highly efficient mass production style of underground concrete forming and placing. Such operations do not require the labor of highly skilled craftsmen, but successfully lend themselves to the use of unskilled labor.

The use of monolithic concrete for the support of weak, heavy ground in large-scale mining operations can show a decided major economic advantage over heavy types of conventional timber and steel support. The greater part of this advantage is a very substantial reduction in the cost required to maintain mine openings. In many cases these maintenance costs are reduced to practically zero. In addition to being a ground support of superior strength, concrete promotes better ventilation and provides better fireproofing, and gives safer, cleaner, more efficient underground working conditions.

Occurrence of heavy ground weight and movement can result in extensive and costly repair operations, as well as being a major handicap to efficient and orderly mine production. The mine operator has two avenues of approach to correct this unfavorable condition: 1) release ground weight and pressure by major changes in the method of mining, or 2) develop ground support with sufficient strength to withstand the required weight and pressure.

Superiority of Monolithic Concrete Support

Many of the large, deep-seated orebodies that are presently being mined have inherent geodynamic characteristics which are inducive to heavy



Top of grizzly drift forms during the pouring operation. Note the draw raise box-outs, brow beams and six-in. concrete slick-line pinned against back of the raw, rock-bolted excavation

ground weight and pressure in large-scale underground mining operations. Therefore, the best solution lies in the development of ground support of adequate strength that will also be economically feasible. Concrete has met this requirement in many of the large underground block caving mines of the world.

The theory of the superiority of monolithic concrete ground support is quite simple. It is complete area support, not point or line support. Properly placed concrete supports practically every square inch of open ground along the perimeter of an excavated area. This type of area support gives uniform loading and dissemination of concentrated pressure stresses in heavy ground. In area loading the entire supporting structure is used to its full advantage. This can only be partially accomplished with timber and steel support by back-filling between the ground and the supporting structure with fine muck or sand. Back-filling is slow and expensive, and where it is not done only point or line support can be achieved at the best.

Monolithic concrete area support will seal and tie weak, blocky, slabby ground together so that the ground can withstand greater compressive strength. Under such conditions ground failure and deterioration can only take place by a complete failure of the entire supporting structure.

Minor Yielding Relieves Stresses

In many cases concrete support in heavy ground will show some movement and cracking without this being detrimental to its ability to support. Such action may actually be beneficial due to the fact that it relieves exceptionally high stresses by a minor amount of yield.

In principle, area support allows minimum ground disturbance and, hence, minimum weight and pressure. The more ground is disturbed, and the more it is allowed to move, the greater the weight and pressure will eventually become. This is not to be confused with a very gradual controlled minor yield or relief which has demonstrated very beneficial results in heavy ground support. A controlled, gradual yield would not be considered ground disturbance in the above discussion.

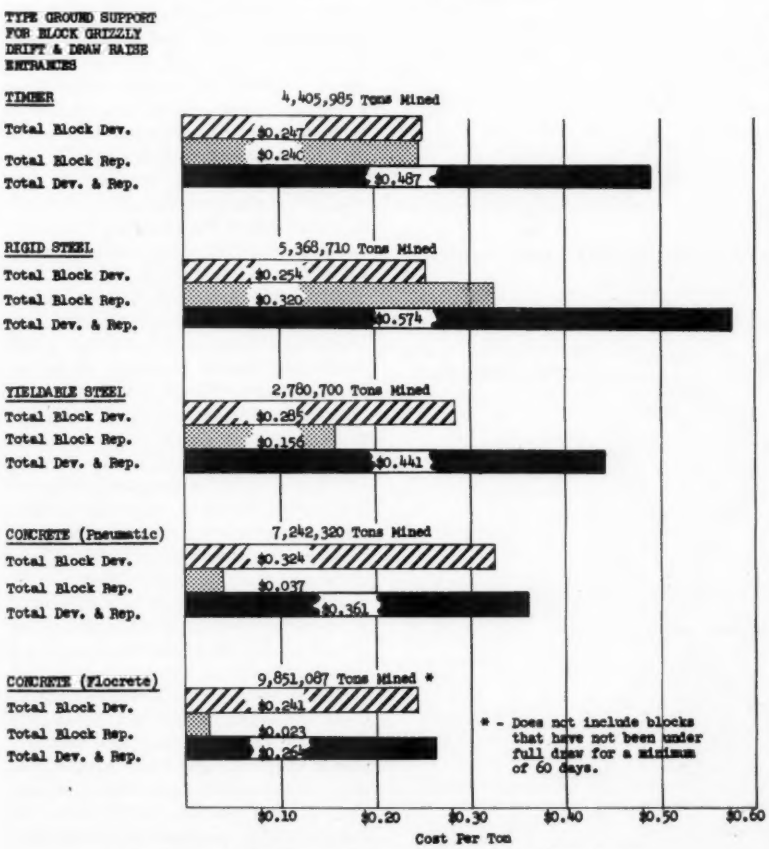
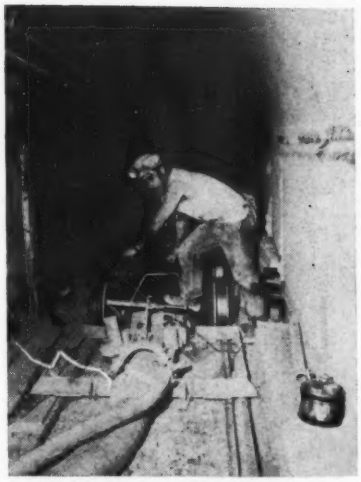


Fig. 1. Block development and repair costs at San Manuel mine



Portable placer discharges concrete into grizzly drift forms

At the San Manuel mine, where ground weight and pressure have been a major problem, approximately 4000 cu yd of concrete are being currently placed for ground support in the mining area every month. This volume of concrete is placed for one reason only; because by doing so the mine can place a ton of ore on the surface at less cost than by using any other type of known ground support in the weak, heavy, moving ground in its mining area.

Early Experiences Were Surprising

The San Manuel mine is an underground block-caving operation which has been in production approximately four and one-half years. During the first 3½ years of this period, the mine produced over 33 million tons of low grade copper ore, and is currently producing about one million tons of ore per month.

It became apparent early in San Manuel's mining operations that heavy timber support in block grizzly and panel drifts was not adequate for the ground weight and pressure encountered. To correct this unsatisfactory condition, rigid steel support was used to replace timber wherever possible. This practice actually increased both development and repair costs rather than decreasing them. In the next step, yieldable steel sets were used where practical to replace rigid steel. All sets were well packed with fine muck and had heavy lateral bracing. Development costs were increased but repair costs showed a substantial decrease. Of the timber and steel types of support, yieldable steel proved the more economical.

Monolithic concrete support was

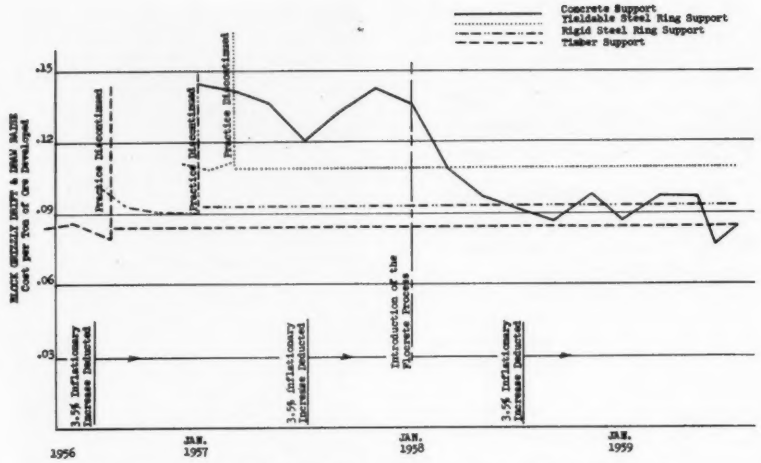


Fig. 2. Block grizzly drift and draw raise costs per ton of ore developed

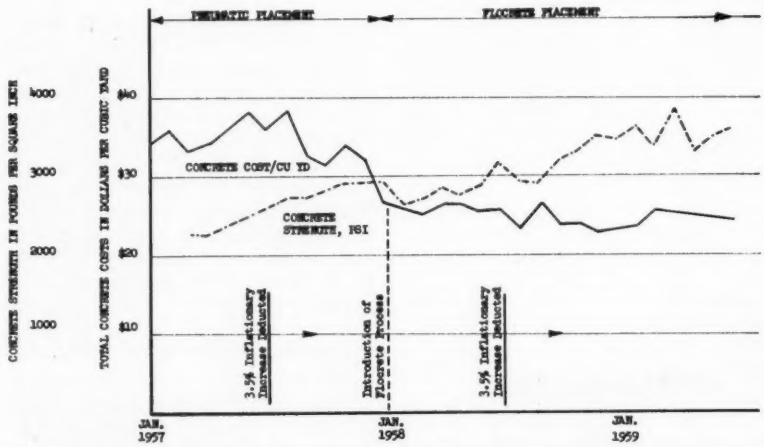


Fig. 3. Total underground concrete forming and placing costs and concrete compressive strength

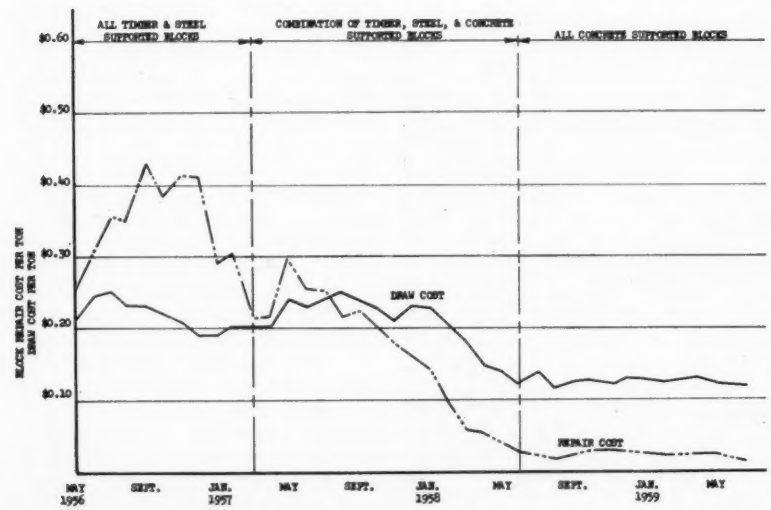


Fig. 4. Stope repair and draw costs using various support materials

first tried on a relatively crude experimental basis. Early results with poorly placed, poor quality concrete were surprisingly good, and showed great economic potential, providing that a cheap, fast and efficient method of underground concrete forming and placing could be developed.

Concrete forming and placing was started on a large-scale in January 1957. Concrete was mixed on the surface, dropped down cased churn drill holes to a small re-mixer where it flowed into stationary pneumatic placers, and was blown through 6 in. Victaulic pipe lines into the drift forms from 500 to 2500 ft away.

Forming was accomplished by bolting small portable plywood panels together and blocking and bracing them with timber. Development costs from this practice showed an increase, but repair costs were reduced to a point that, for the existing mining conditions, concrete became the most economical means of ground support in block grizzly and panel drifts. The cost per yard of concrete was high and the strength of the concrete was low.

Block Development Costs Reduced

In an endeavor to lower the relatively high block development costs and improve the strength of the concrete poured, the entire method of placement was revised and the Flocrete process of placement was initiated. The results, to date, have shown good cost improvement, as can be seen by a study of figures 1 through 5, which show the types and relative development and repair costs of block grizzly and panel drift ground support. Further cost benefits are anticipated by the use of jumbo placed steel forms now being used in block panel drifts and in the planning stage for block grizzly drifts.

All the reduction in block development cost is not due alone to the more efficient method in concrete placing, but it is by far the greatest contributing factor. Steadily improving methods and efficiency in all phases of block development work over the past three years accounts for some of the cost reduction. The use of well placed concrete ground support is solely responsible for the reduction in block repair costs.

The present method of placing concrete underground at San Manuel is described as follows: Bulk cement, screened minus one in. coarse aggregate, and washed sand are delivered to a 300-ton surface batch plant located roughly one mile from the mining area. One and one-quarter cu yd

dry batches of cement and aggregates are weighed and loaded into five cu yd dump trucks, which have four 1¼-cu yd batch compartments. The dump trucks make the one mile haul to a 1¼ cu yd dual-drummed, track-mounted surface mixer located on the fringe of the mining area.

Transfer of Concrete to Underground

Concrete for the first mining level is poured down one of two 12-in., cased, churn drill holes with eight-in. steel alloy liner pipe. One hole is located along the north fringe and one on the south fringe of the orebody, a safe distance away from surface subsidence. The mixer and chilled water plant are moved from one surface location to the other to meet the convenience of the underground placing crews.

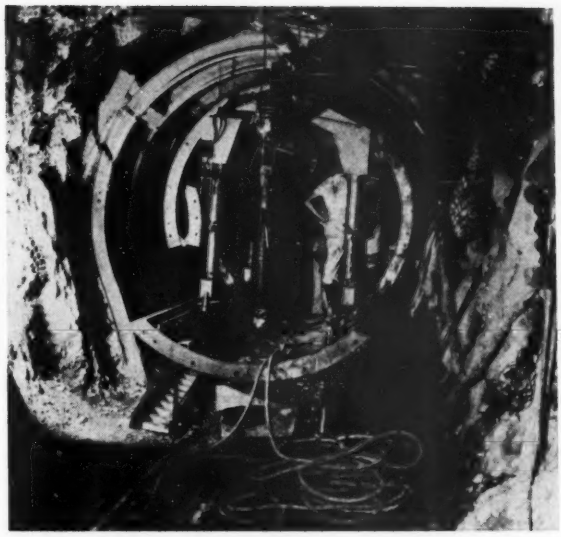
Concrete for the second level is dry-batched to No. 1 shaft where a track-mounted 1¼ cu yd mixer located at the shaft collar does the mixing and pours down either of two 8-in. standard pipe lines mounted in the shaft service compartment. (See figure 7).

At the bottom of the churn drill holes and shaft lines, heavily reinforced 16-in. diam pipe headers receive the impact shock of the falling concrete and chute it into six-cu yd remixers.

In the two churn drill holes serving the first level, severe wear is experienced in the liner pipe due to the inherent crooked alignment of the holes. In order to change these wear points so the liner pipe will not wear through and be grouted in, once a week the liner pipe is rotated 90° and lowered 30 ft. This 30 ft is cut off underground at the remixer station and an additional 30 ft is welded on at the surface.

To detect a hole worn in the liner pipe before the pipe becomes grouted in place, 20 gpm of clean water is introduced at the churn drill hole collar. This water circulates between the 12-in. drill hole casing and the eight-in. liner pipe. At the bottom of the hole, the water discharges into an open funnel located in the remixer station. If there is a hole worn in the liner pipe, milky water and sand are immediately observed in the funnel when concrete is being passed through the drill hole. When this happens the liner pipe must be pulled and the worn sections replaced.

Bitter past experience has shown that a worn liner pipe will grout itself in and rapidly deteriorate to the point that concrete cannot be passed through it. When this happens the entire bore hole is lost. The practice at San Manuel is to use heavy alloy steel liner pipes and keep them in good condition.



Hydraulic-powered form jumbo placing circular steel forms in panel drifts through the mining area of the grizzly level

Spiral Agitators in Remixers

The remixers at the bottom of the concrete lines have a capacity of six cu yd. They are eight ft long by 5½ ft diam tanks with the top side section cut out to receive the concrete. A special spiral agitator, built around a four-in. tubular shaft mounted on water-lubricated bearings and driven by a chain-connected ten-hp air motor, extends the length of the tanks. Its slow, steady rotation remixes the concrete, which segregates during its long vertical fall, and keeps it plastic while awaiting transit to the underground forms.

A separate telephone circuit and light-bell signal system are maintained between underground remixer and surface mixer. A standard system

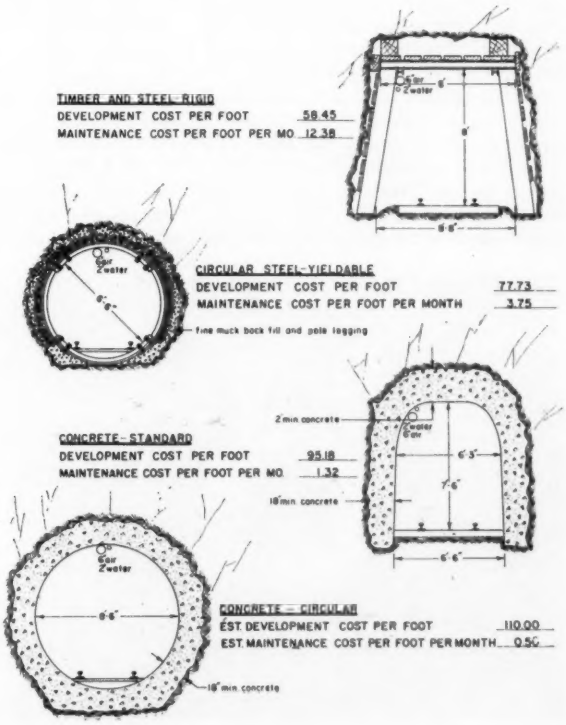


Fig. 5. Types and cost of stope panel drift support in heavy mining areas

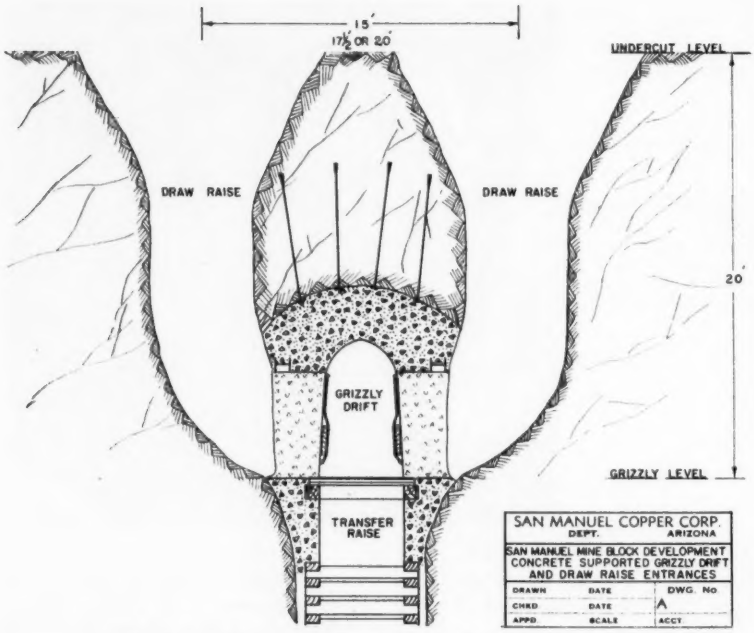


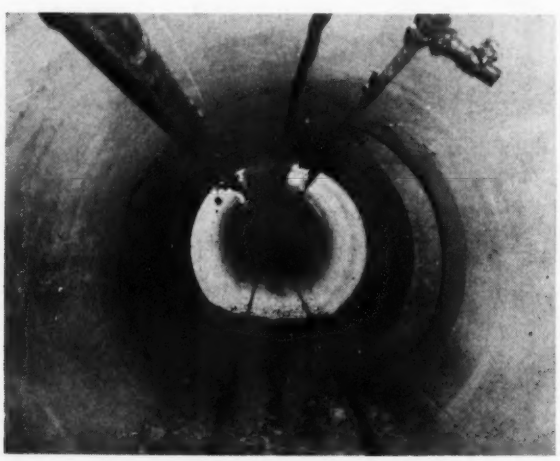
Fig. 6. Concrete supported grizzly drift and draw raise entrances

of bell signals is used for ordering, sending and indicating receipt of concrete. This eliminates the danger of pouring several batches on top of each other in case the hole plugs.

Concrete is moved from the underground remixer to the drift forms by trains of four to six portable Flocrete placers with 1.4 cu yd capacity. The placers are wheel-mounted and have San Manuel's standard automatic car couplings. They are quickly trammed to any desired place on the level by eight-ton battery locomotives. A small air-operated chute in the bottom end of the remixer permits concrete to be loaded into a placer through an opening at its top. This opening is closed by a swivel-mounted rubber covered hatch which is clamped down after the pot is loaded and gives an air-tight seal when air pressure is induced.

A track-mounted underpass is used in the stope panel drifts about 100 ft from the concrete forms that are being filled. This underpass holds the six-in. concrete discharge or "slick-line" carrying the concrete to the forms. A quick coupling attachment is mounted on the end of the slick line for connecting to the placer. Compressed air from the regular mine air system at 90 psi is piped to the underpass where it is transmitted to the portable placer through the quick coupling attachment. Quick coupling hooks operated by an eccentric lever draw the placer into position and lock it for an air-tight seal between the concrete discharge pipe and the compressed air inlets. The operator quickly discharges the concrete in the placer through the slick line and into the forms by opening a check valve at the front of the placer and working the compressed air control valve, which allows compressed air to flow through the bottom of the placer and push the concrete through the discharge line. As each placer is emptied it is uncoupled from the discharge line, which is hoisted by air-powered cylinders a sufficient height to allow the empty placer to be pushed through the underpass. The underpass pipe is then lowered and the next loaded placer is brought up and emptied. In normal operation a train of six placers, or roughly 8.5 cu yd of concrete, are placed in the forms in about 15 minutes. (See figure 8).

An efficient operation demands that a minimum of two sections of forms are being filled simultaneously. This always allows an available place to dispatch concrete trains if plugs or delays have occurred at a form section. Concrete trains are dispatched by means of the mine radio and audio communication systems. For best overall results, concrete trains must be kept moving. It is a "high ball" operation.



Completed circular concrete-lined drift. Note entrance to block grizzly drift in foreground

Concrete Packed Against Rock

At the forms, one man is used to shift the lightweight, quick coupled slick line so the form will fill evenly. As the form is filled and the pour retreats, sections of the discharge pipe are taken off and removed from the form. The freshly placed concrete in the forms is vibrated by hand-held air machines and exceptional care is taken to see that the concrete is packed against the rock.

Normal procedure is to fill a 30 to 60 ft section of panel drift form in one pour and 52.5 to 105 ft of grizzly or slusher drift in one pour; however, ground conditions do not always allow this much footage to be poured at one time. Concrete has been placed through as much as 500 ft of six-in. line with three 90° bends, and as high as 60 ft vertically without the benefit of a compressed air booster and without operational difficulties.

Where the ground permits, drifts that are to be supported with concrete are driven raw, using six-ft rock bolts with wire mesh for pre-concrete ground support. In cases where the ground will not stand with this type of support, light timber sets are used, having sufficient width to allow proper setting of drift forms between sets. The light timber sets are left in place and concrete is poured around them.

In prematurely heavy ground it is necessary to replace the light timber set with a steel set of six in. wide flange section. This is done only where absolutely necessary, as structural steel imbedded in the concrete has proven detrimental to concrete support of heavy, moving ground and where heavy secondary blasting is required.

It is the practice at San Manuel to keep as much steel out of the concrete as possible. Steel imbedded in the concrete is confined to wear beams at the brow of draw raises, eyes, hooks, and brackets for control board cables, safety chains, pipe lines, and slusher sheaves. No reinforcing steel is used in the heavy ground concrete support of the mining areas.

Forming Done with Plywood Panels

In the block grizzly and slusher drifts that contain no track and are at right angles to the tracked panel drifts, forming is accomplished by using portable, light, strong plywood panels. These forms are made in the mine carpenter shop from 5/16-in. plywood with two by six-in. wooden ribs. The standard panel is five ft ten in. in length, which is an even interval for 17½ ft draw point spacing. Grizzly drift sections are composed of two straight side panels and two arched back panels bolted together with ⅝ in. by four in. machine bolts. A slusher drift section uses an additional 12-in. wide panel bolted between the two arched back panels along the top center of the drift. Properly placed holes in the form panels allow the quick placing of eyes, hooks, and brackets that are to be embedded in the concrete.

In grizzly drifts the forms are set on leveling sills laid on the raw floor. Between the side of the forms and the rock walls, the floor is dug to solid and cleaned of all loose muck. In slusher drifts, a 12-in. concrete floor with embedded wear rails is poured between the concrete drift walls. A narrow slit in the form allows one in. rough lumber to be sectionally placed between the form and the ground to make draw raise box-outs. These one in. lumber box-outs are braced with three-in. by six-in. studding.

After the forms are set, lined, and leveled, they are stull-blocked to the ground and well braced internally with rough three-in. by six-in. timber. The drifts are driven and the forming is done to allow a minimum thickness of 18 in. of concrete in the drift walls and arched roof. Finished grizzly drifts are four ft wide and 6½ ft high, and slusher drifts are five ft wide, 6½ ft high.

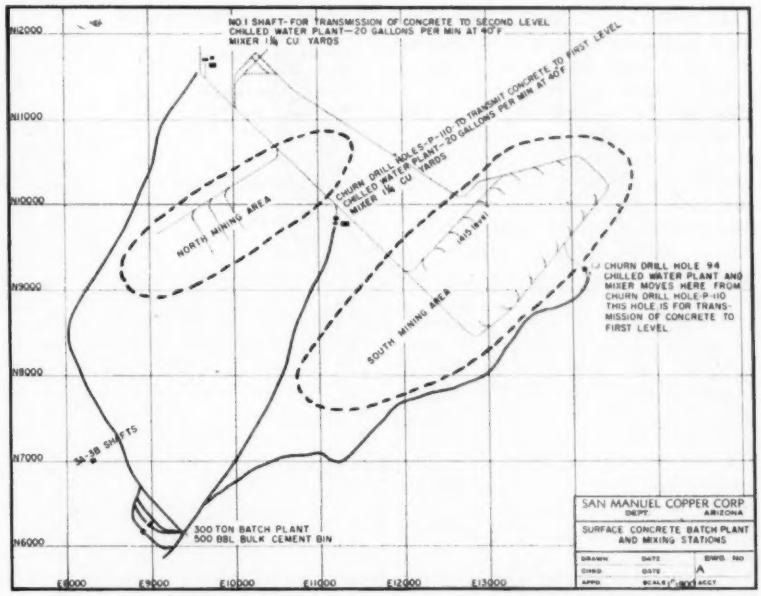


Fig. 7. Location of surface concrete batch plant and mixing stations

Hydraulically Operated Form Jumbo

Tracked panel drifts were previously formed in a manner similar to the grizzly and slusher drifts. This practice has now been replaced by the use of circular, jumbo mounted steel forms ten ft in length. They are transported and expanded into position by a hydraulic-powered track-mounted jumbo. In the stripping process, the jumbo contracts the forms and they are then in a position to be transported through the existing forms indicates a reduction in form-placing. Light steel bubbles bolted to the outside of the forms are used to form grizzly and slusher drift entrances. Early performance of these forms indicates a reduction in forming labor costs of 50 percent over previous methods. Panel drifts are driven and forms are placed to allow a finished circular section of 8½ ft, with a minimum thickness of 18 in. of concrete.

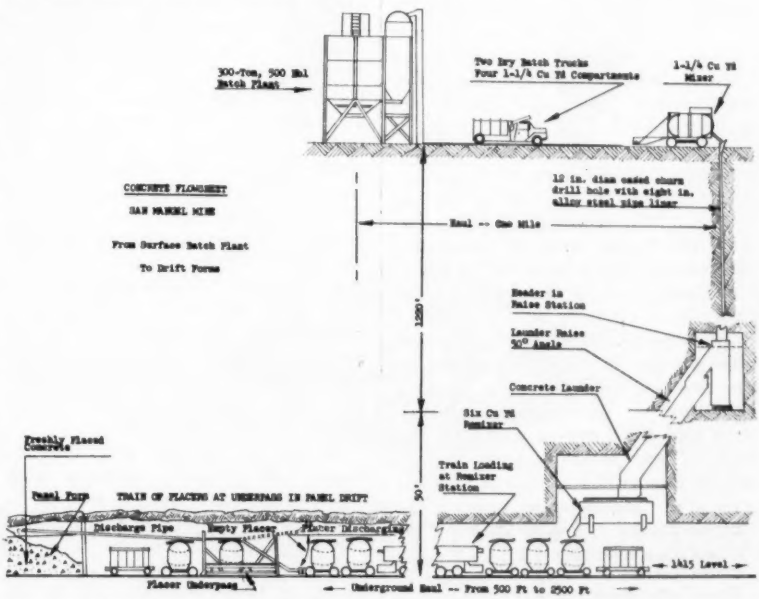


Fig. 8. Concrete flow from surface batch plant to drift forms

In order to obtain the desired results in underground placed concrete without the use of excessive cement, a closely controlled mix is necessary. It must also be appreciated that, in order to obtain the necessary speed and efficiency in underground placing, some of the rigid concrete specifications for surface construction must be relaxed. The problem is not to build a 50-year monument, but to economically support heavy ground until the ore can be extracted.

A 1¼-cu yd mix giving an average 28 day strength of 3500 psi, allowing fast, efficient placing with current practice consists of: 705 lb of type II portland cement; 1300 lb of clean, washed sand having five percent minus 100 mesh; 2200 lb of strong, cubical, minus one-in. screened coarse aggregate sized within limits of ASTM specifications; 48 gal of clean, pure water; 14 oz of air entraining agent for added workability, and 21 oz of Plastiment as a retarder and strengthener. This mix gives a slump of from five to six in. at the mixer and three to four in. in the forms.

Portable Chilling Plants Cool Mix-Water

Due to the hot, arid climate in southern Arizona it is necessary to cool the mixing water from May through October. Portable electric powered water chilling plants are through October. Portable, electric used which are capable of producing 20 gpm of 40° F chilled water. The chilled water reduces the temperature of the aggregate so that concrete temperatures at the mixer are kept in a 70° F range. The concrete loses a considerable amount of water in its journey between surface mixer and underground forms. A water to cement ratio of 0.58 to 1 is maintained, which keeps the mix workable but does not allow the accumulation of free water in the forms. The set of this mix is retarded by the use of additives so that concrete can stay a maximum of three hours in the portable placers and be discharged satisfactorily.

An average of 150 cu yd of concrete per day is now being placed on the two mining levels. The pouring operation is accomplished on 'A' shift and the forming operation on both 'A' and 'B' shifts. Crew personnel for this work is shown as follows:

Surface Crew:	*'A' Shift*	*'B' Shift*	*Total*
Batch plant operator	1		
Truck drivers	3		
Mixer operators	2		
Total	6		6
Underground Placing Crew:			
Leadmen	2		
Re-mixer operators	2		
Motormen	3		
Placer operators	3		
Puddlers in form	3		
Pipe riggers		2	
Total	13	2	15
Underground Form Crew:			
Leadmen	2	2	
Form men	5	5	
Helpers	5	5	
Total	12	12	24
			45

This crew has placed a maximum of 230 cu yd of concrete in one eight-hour shift. The underground placing and forming crew work under a contract bonus system where they are paid each week for the work they accomplish.

The costs shown in this article cover all direct supervision, labor, material, and some of the equipment maintenance. For the purpose of a fair and conservative evaluation, these costs were reduced to a 1956 year base. This was done by reducing the costs for work accomplished after July 1956 by the same percentage that mine labor has been increased, which is roughly 3.5 percent a year. It will be difficult to compare these costs with those from other operations due to the different manner in which individual companies keep their cost accounts.

THE ELECTRIC WHEEL DRIVE IN MINING

(Continued from page 65)

Because of "power proportioning," power applied to the d-c wheel motors goes to the wheel requiring it so that wheel spinning is eliminated. For example, if three of the four wheels had zero traction on glare ice and one had traction, applied power would go only to that one having traction and no spinning would occur in the other three wheels. This has a most important effect on tire life as has the very gradual acceleration possible with the d-c motor drive and conversely, the very gradual deceleration possible with dynamic or resistance braking.

The high speed capability of this machine on steep grades reduces the distance to be traversed in moving material from the shovel to the waste dump and from the shovel to the ore disposal point. This, in turn, reduces the time requirement to give a net result of greatly increased truck duty. Not only has this new truck doubled the operating speed on adverse grades, but it has more than doubled the grade which can be ascended. The company expects ultimately to more than double its load capacity compared to the largest pit trucks now in operation. In fact, it is unlikely that the new truck's ultimate duty will approximate three times that of present equipment.

Shovel and dipper size requirements will naturally increase with increased truck capacity and it is indicated that where a six-yd 150-B or a six-yd 1600 shovel was formerly satisfactory with 34-ton truck units, an 11 or 12-yd machine will be required with these 75-ton trucks where adaptable, and, of course, the shovel duty will be correspondingly increased.

Hauls 75-Ton Loads Up a 15 Percent Grade at 12 MPH

The truck is at present hauling 75-ton loads up a specially built 15 percent roadway which has been equipped with an overhead trolley. This loading on this grade has not required anything close to the unit's maximum rated horsepower—that is, 1600 hp total or 400 electric hp in each of four wheels—although its speed on the grade is at the rate of 12 mph.

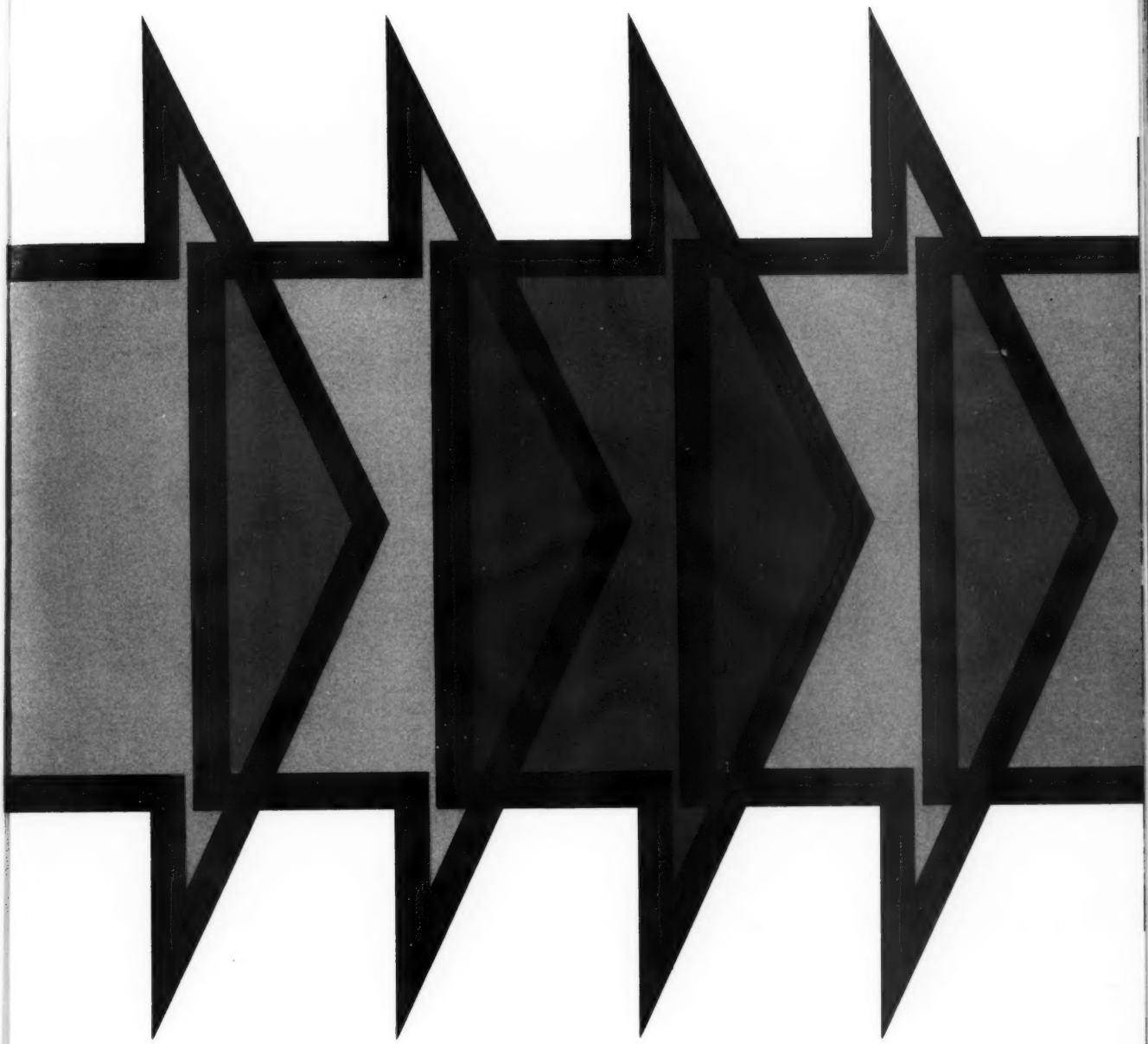
In the loading and dumping areas which are not covered by trolley facilities, the electric wheel motors are motivated by a 335-hp Cummins diesel engine connected to a d-c generator. Auxiliaries are operated by an a-c generator connected to the same power source. Loaded trucks move on the level at 10 mph on the diesel power. Steering as well as dumping is accomplished with a-c motors operating on a rack and pinion.

Some minor changes, such as automating the raising and lowering of the trolley pole, are being made.

Additional specifications are as follows:

Over-all length	**41 ft**
Over-all height	**16 ft 7 in.**
Over-all width	**14 ft 7 in.**
Empty weight	**56 tons**
Struck capacity	**40 cu yd**
Heaped capacity (3 to 1)	**50 cu yd**
Heaped capacity (1 to 1)	**60 cu yd**

Powered by four 400-hp 600-volt d-c motors in each of the four wheels. Auxiliary 335-hp Cummins diesel connected to d-c and a-c generators.



FROM GREAT LAKES STEEL

15 X-A-R 30

ABRASION RESISTANT STEELS

TWO NEW STEELS—HARDER FOR HARDER JOBS



X-A-R

ABRASION RESISTANT STEELS

HARD ENOUGH AND TOUGH ENOUGH TO LAST W

Is abrasion your constant enemy? If your equipment meets materials as they're scooped, shoved, slid, pushed, dragged or dumped, does it face the recurring threat of downtime for repairs or replacement? To eliminate such maintenance headaches, Great Lakes Steel has developed two tougher, harder alloy steels—X-A-R 15 and X-A-R 30. They're supplied in hardnesses from 360 to 400 BHN (or, by agreement, in a range of hardness between 265 and 500 Brinell). And they're especially effective and economical in those critical bear-the-brunt areas of the equipment where wear is worst—liners, teeth, bars, blades and plates, for example. *Under conditions that commonly wear out equipment in a hurry, X-A-R abrasion-resistant steels outwear any other type of steel.*

Great Lakes Steel is a division of



T WHERE MATERIALS COLLIDE WITH EQUIPMENT

Chemical composition alone is not the secret of low carbon X-A-R steels; their balanced combination of uniformity, high strength, hardness and toughness is the result of close control during heat-treating, quenching and tempering. This makes them more workable, too. Under normal welding and fabricating conditions use X-A-R 30. For *extremely* difficult problems, such as welding under cold conditions or extensive flame cutting, choose X-A-R 15.

X-A-R abrasion resistant steels are immediately available in ⅛″ to 1″ thicknesses, widths up to 72″ and lengths up to 35′. For technical information and supply sources, see next page.

X-A-R

A PRODUCT OF

GREAT LAKES STEEL

Detroit 29, Michigan

NATIONAL STEEL CORPORATION

15 X-A-R 30

TECHNICAL INFORMATION

CHEMICAL COMPOSITION

X-A-R steels are furnished at two specified carbon ranges. These are 14 to 20 carbon for X-A-R 15 and 25 to 30 carbon for X-A-R 30. The balance of the typical composition is:

Manganese	.80%	Chromium	.65
Phosphorous	.020	Molybdenum	.20
Sulphur	.028	Zirconium	.06
Silicon	.60		

TYPICAL MECHANICAL PROPERTIES

	At Brinell Hardnesses of: 363	400
Tensile Strength, psi	180,000	200,000
Yield Strength, psi	165,000	180,000
% Elongation in 2"*	17	16
% Reduction in Area*	56	55
Charpy V Impact at —75°F.	12 (Ft. Lbs.)	7

*Based on standard .505" specimen

ENGINEERING DATA

Resistance to Atmospheric Corrosion (Rural, Marine, and Industrial Environments)	3-5 times copper-bearing or carbon constructional steel
Compressive Yield Strength, psi	Approx. equal to Tensile Yield Strength
Ultimate Shearing Strength, psi	Approx. equal to Tensile Yield Strength
Modulus of Elasticity, psi	29/30,000,000
Endurance Limit (rotating beam)	60% of Tensile Strength
Coefficient of Expansion per °F.	70°F. to 200°F.—.0000062

FABRICATION

Cold Bend Test: Moderate bending can be performed within the usual range of hardnesses. For free bending, it is recommended that a mandrel be used not less than ten times the thickness of the metal through an angle of 90°.

Welding: Low hydrogen electrodes are recommended for welding X-A-R steels. The grade of electrode used is dependent on the strength requirement of the weldment.

Burning: X-A-R steels can be flame cut without pre-heating or stress relieving after cutting.

COMPLETE METALLURGICAL SERVICE

In addition to the information given in this folder, there is a great deal of detailed data available to steel users covering all characteristics of X-A-R steels. Furthermore, a thoroughly competent metallurgical service organization is available to work with you on any application problem you may have.

X-A-R STEELS ARE AVAILABLE AT THESE STEEL SERVICE CENTERS

BENEDICT-MILLER
Lyndhurst, New Jersey

JOSEPH DEMSEY COMPANY
Cleveland, Ohio

DUCOMMUN METALS & SUPPLY COMPANY
Los Angeles, California

INTERSTATE STEEL COMPANY
Evanston, Illinois

LOCKHART IRON & STEEL COMPANY
Pittsburgh, Pennsylvania

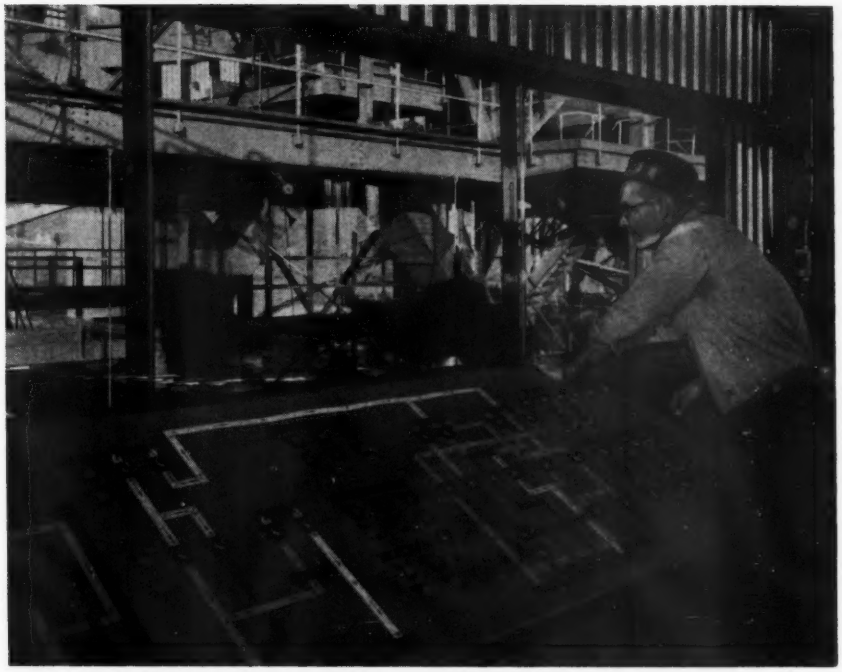
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Control tower for loading railroad cars. The operator not only controls the movement of cars under the loading points but also operates all the gates in the plant necessary to load the various sizes and grades of coal on their respective tracks

A better product at a lower cost

Progress in preparation plant automation

By R. E. JOSLIN
Manager
Preparation Department,
Clinchfield Coal Co.
Division of The Pittston Co.

THE subject of preparation plant automation is a most timely and important one. Mechanization underground has progressed very rapidly in the last few years. So it follows that preparation plants of necessity have to follow the same course. At a time when other industries are applying every conceivable amount of control engineering to reduce costs and up-grade their products, the coal industry will, as in the past, do its part to produce a better product at a lower cost.

"Automation," writes Aronson, "substitutes mechanical, hydraulic, pneumatic, electric, and electronic devices for human effort and decision."

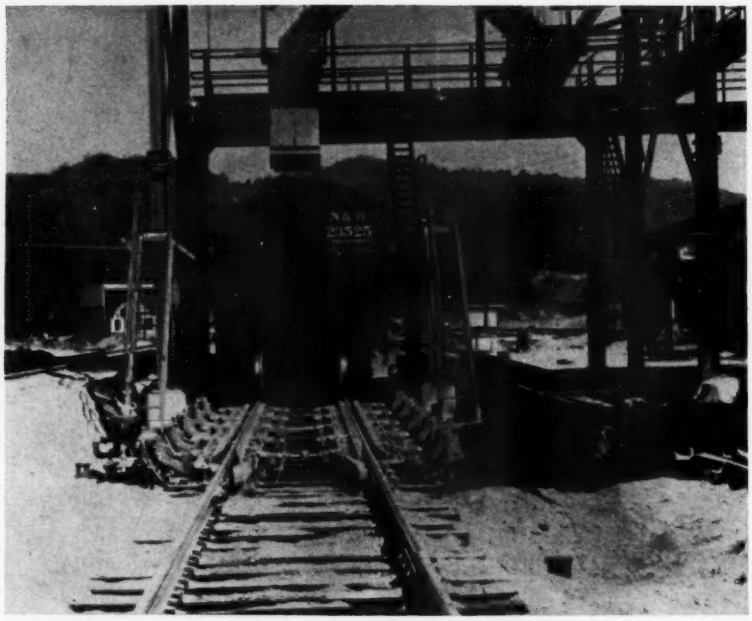
When one thinks of automation as applied to preparation plants, several things come to mind:

1. **Increased tonnage**
2. **A quality controlled product**
3. **Mechanical labor replacing manual labor**

Instrumentation problems in modern coal preparation plants can be compared to those in any modern factory or modern oil refinery. At the Moss No. 3 preparation plant of Clinchfield Coal Co., 1500 tph of raw coal is fed to the plant where it is separated into four products: (1) high-grade metallurgical coal for the steel industry, (2) steam coal for public utilities, (3) aggregate for making lightweight concretes, and (4) refuse or waste. Each product is washed, heat-dried and sized to specifications. When one considers this tonnage and knows that each product is controlled for quality, size, etc., the need for instruments in the plant is obvious.

Two Men Control Entire Movement of Railroad Cars

Moss No. 3 preparation plant is controlled essentially at three control centers. The operator at the main control panel regulates the flow of coal from the raw coal bin to the point where the coal is discharged to the heat drying plant. He also controls all pumps and water flow through the plant. The heat drying plant is controlled by its own control panel. This operator regulates the flow of coal into and out of the heat drying plant and all furnaces and dust collectors in his related section. The operator at the loading-out sta-



A track brake system controls the loaded cars from the loading point to the storage yard

tion has control of the coal from the drying plant into the railroad cars. He controls all necessary gates to load the various sizes and grades on their respective tracks, plus the movement of railroad cars under the loading points.

At the plant, coal is received in railroad cars and dumped in a rotary dump. As the cars leave the dump, they are handled by gravity control using Union Switch & Signal Company's compressed air-operated car retarders. No riders or brakemen are used on the cars. When the car leaves the rotary dump, it goes by gravity to the first retarder where it is automatically stopped, and a man sets the draw-heads and the electrically-operated switch to send the car to the loading track on which it is to be loaded. The car goes by gravity from this point to the loading point, where it is controlled by retarders while being loaded. The cars at the loading point can be loaded automatically by using a special target and limit switch arrangement. This has worked very satisfactorily.

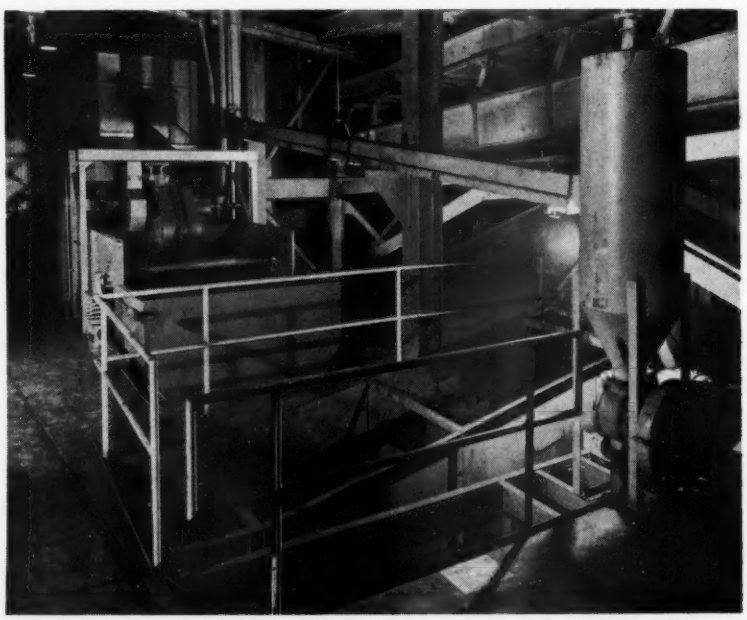
Approximately 1200 tph of clean coal is being loaded and two men control the entire movement of the railroad cars. Without the car retarder system, it would take an estimated five more men per shift, or 15 more men per day. With this system, the company is able to maintain a steady flow of coal into the railroad cars, because there are no delays due to hoists, ropes, etc.

After the car is loaded, it is uncoupled and released from the retarders; it then goes by gravity to the loaded yard. Electric switches are used to switch the car to the proper track. One type R retarder is used between the loading point and switch point to the loaded tracks to control the speed of the car into the loaded yard. No trouble has been experienced with this retarder system even though operating temperatures vary from 100° in summer to 0° in winter.

Handling Magnetite for Dense Media Vessels Posed Problem

In the plant there are nine dense media vessels, and the storing and transporting of magnetite to the vessels presented a major problem. Let us examine the system employed by Moss No. 3 for handling magnetite.

Magnetite is received in "airslide" railroad cars. (Fruehauf Trailer Co. is now building an "airslide" trailer with a pump to pump magnetite to a bin.) From the "airslide" car, the material is moved by air through a Fuller-Kinyon pump, which pumps it into a 200-ton bin at the top of the plant. The connection from the railroad car to the "airslide" which moves the magnetite into the bin requires about five minutes to connect and disconnect. There is no other manual labor required to unload a 70-ton railroad car. From this bin, "airslide" equipment takes the magnetite by gravity to each vessel. At the end of each "airslide" and over the magnetite sump, there is a small hopper which holds roughly 500 lb of magnetite. On the bottom of each hopper there is a motor-operated rotary valve which is controlled at the main control panel. To add magnetite to the vessels, it is only necessary for the operator to start the rotary valve, and an electric timing mechanism



An "airslide" conveyor brings magnetite from the storage bin to the surge hopper above the vessels. Note the rotary valve on the bottom of the small surge hopper; it is motor operated and controlled from the main control panel

automatically stops the valve when the desired amount of magnetite has been added.

Nuclear Specific Gravity Indicators Up Quality

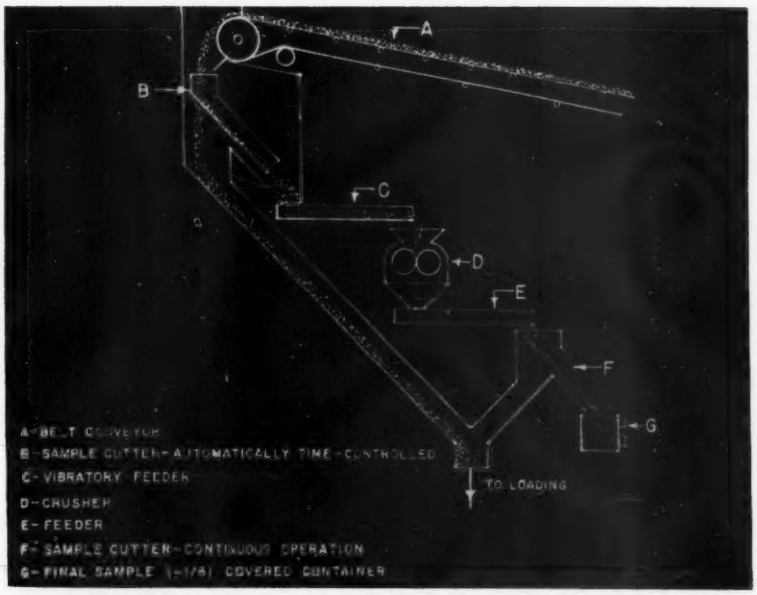
One of the most important problems in any coal cleaning plant is the control of specific gravity at which the products are separated. For example, if gravity of separation is allowed to increase from, say, 1.3 to 1.35, the ash in the clean product will be higher than normal. On the other hand, if gravity is allowed to decrease to, say, 1.25, the company would have a lower than normal ash and at the same time be discarding low-ash coal to waste. Even under the best conditions, manual control is accurate only to ± 0.02 sp gr. When the operators have other duties to perform or are careless, manual gravity-cup readings can vary ± 0.03 sp gr. Such wide variations in Clinchfield's coal could mean variations in ash content of 0.75 percent from mean to extreme. It takes about two minutes to take a proper reading manually with gravity cups. For good operation, authorities recommend taking these readings every 15 minutes. With nine vessels to control, this means that one man, doing nothing else, would require 18 minutes between readings. In this short period, with a reading on the low side, it is possible for the vessel to operate for 30 to 45 minutes at too high or too low gravity.

To assure customers of consistently high quality coal which does not vary from required standards, Clinchfield has installed nuclear specific gravity indicators on all nine dense media vessels. The nuclear density measuring system determines the density (or specific gravity) of fluids flowing through the measuring head. The meter includes an indicator on its front panel, and a recorder has been connected to provide 24-hour recording of performance.

This density measuring instrument operates on the principle of radiation absorption. On one side of a short section of pipe is mounted a gamma radiation source; a radiation detector is mounted on the other side. Because radiation absorption is proportional to the mass it is passing through, the amount of radiation received by the detector varies as the density of the constant-volume of material in the pipe changes. The electrical signal from the detector is preamplified and read out by a recording and controlling instrument.

The heavy construction of the measuring head not only provides a rugged housing, but also serves to lower the radiation external to the unit to a level below the recognized tolerance.

With this instrument, the operators know at all times the specific gravity of all nine separation vessels. By accurately controlling the gravity, the company is assured that the ash content of the product loaded into the railroad cars will be well within the tolerance allowed and that each car of coal loaded will be exactly what the customer specifies.

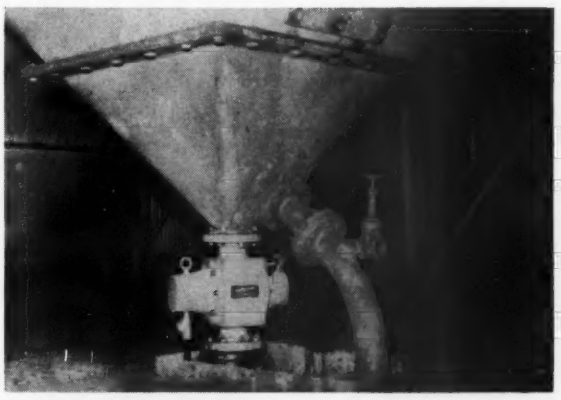


Schematic drawing of the automatic sampling system. All coal is sold on a guaranteed analysis basis

Sampling is Automatic

As all coal is sold on a guaranteed analysis basis, the sampling of loaded products is automatic. This sampling is by automatic equipment on each loaded track. There are four belts which bring the coal from the plant to the loading point. At the end of each of these belts is an automatic sampler. It is automatically timed to cut the main stream of coal every two minutes. Width of the cutter is 3¾-in. and it takes approximately 100 lb of coal at each cut. This coal is fed to a crusher by a feeder. Coal from the crusher goes into a vibratory feeder. At the end of the feeder is a continuous cutter which takes the final sample. This sample is collected into a covered container to avoid loss of moisture. From this sample, the final sample for the laboratory is prepared.

(Continued on page 89)



The Accu-Ray density measuring head operates on the principle of radiation absorption

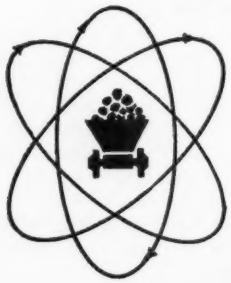
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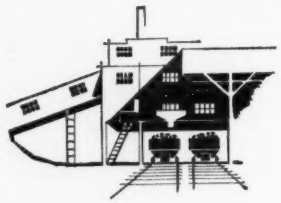
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Thursday, November 17th



A one-day conference on the use of radioisotopes in coal production and handling sponsored by the American Mining Congress and Bituminous Coal Research, Inc., in cooperation with the Atomic Energy Commission.

Friday, November 18th



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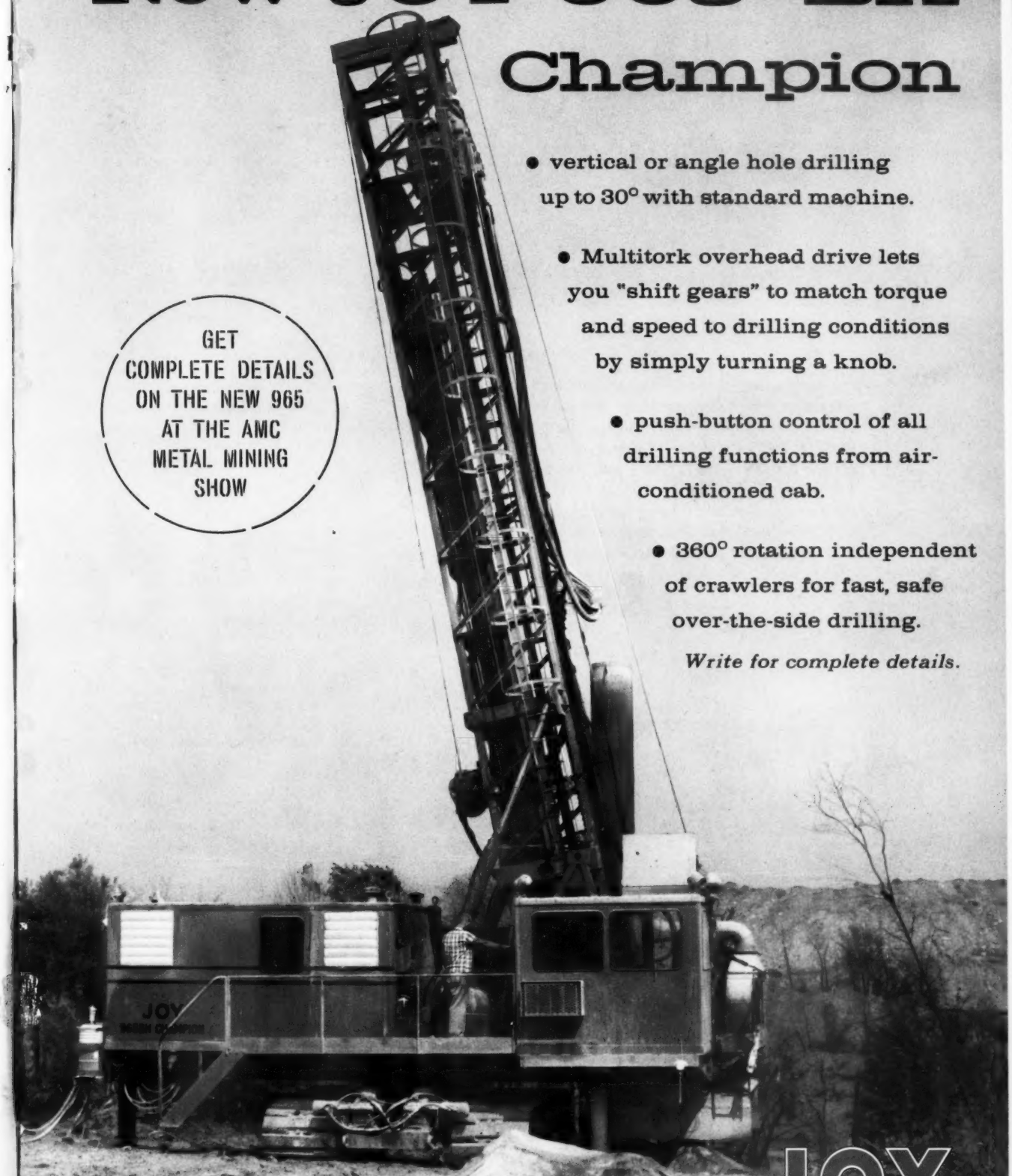
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Two-Way Radio Communications in the Mining Industry

A condensation of a panel discussion among five men whose companies are making extensive use of two-way radio in their mining operations. Taking part in the panel were: Clyde D. Keith, supervisor of new developments, Pickands Mather & Co.; Edward F. Eidam, assistant to general manager, mechanical, Pacific Isle Mining Co.; Douglas R. Mabey, contract engineer, Utah Copper Division, Kennecott Copper Corp.; Edward J. Matousek, manager of general engineering, International Minerals & Chemicals Corp.; and R. V. Bovenizer, chief electrical engineer, Hanna Coal Co.

THE use of two-way radio in the mining industry presents a very broad and somewhat technical field of discussion. Because of this fact, we will project our observations on the uses of radio along a non-technical plane. Mine operators are more interested in what two-way radio can do, rather than what lies beneath the housing over the intricate parts of a radio system.

This article will revolve about three general questions. First, what is two-way radio? Secondly, how is the use of two-way radio applied to the mining operation; that is, how can it best help an operator in the industry? Thirdly, what are the present and future conditions that will influence the use of two-way radio in the mining industry?

What is Two-Way Radio?

Two-way radio is nothing more than another tool for an operator to use. Through the practical application of this means of instant communication, a good operation can often be shaped into a more efficient and safer one. We will soon see how this tool works and how it is applied. Before going into a discussion of detailed radio application, it would be well to review some of the basic principles involving the characteristics and component parts of the particular type of system with which we are working.

Generally speaking, we know that radio allows us to operate more efficiently. How it functions in the mining industry, however, is worth further discussion. Let us compare radio's application to the Defense Department's problem of hitting a specified target. In the past, if an infantryman aimed correctly and planned for any variations such as wind and distance, he would hit the target. The same thing was true for the mining superintendent. If he planned his day's operation and accounted for all variables, he too would hit the target, which in his case, of course, is optimum production.

However, in this world of modern technology the infantryman's target may be an airplane moving at supersonic speeds and with infinite variation in movement. To be assured of hitting this target, it was necessary to develop the guided missile, which could sense any variation in the target's path, compute the corrective action, and transmit this to a compensating device to bring it back on target.

In modern mining, we employ huge equipment capable of high production, that requires skilled operators, maintenance men and supervisors. We, too, must build a guidance system to expedite a complicated operation and compensate for variations in the mining plans. The device that best accomplishes this is two-way radio.

We drew a comparison between two-way radio and guided missiles. Let us expand this further to see where it fits in the organization of a mining company. The plant manager's primary jobs have to do with long range planning, meeting production requirements, shipping schedules, and employe and public relations. Although he is interested, he is not personally or directly concerned with daily production. He controls his plant by conferences with his staff, phone service and memoranda. He has no need for two-way radio.

Provides Immediate Communication

The mine superintendent and his foremen, who are responsible for executing the daily mining plans, have the greatest need for radio in the organization, for they provide the computor aspect of the guided missile and are, in other words, the decision makers.

Consider the opportunity afforded a mining superintendent who has 30 percent availability to a telephone for discussion with a maintenance superintendent who also has 30 percent availability. The mathematical odds against completing a phone call between these two men are about ten to one. With radio these men are available about 90 percent of the time and the odds change to about four to one for a successful communication. If three parties are involved, as frequently is the case, the comparison is

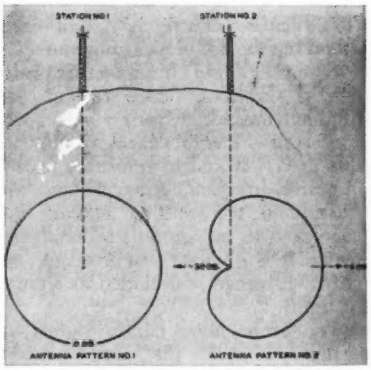


Fig. 1. Arrangement of two stations close together in frequency in limited space. Cardiod type pattern of station No. 2, with "null" back toward station No. 1, permits both stations to cover area without interference to each others' operations

more dramatic—without radio 30 to 1 against and with radio about 3½ to 1 in favor of successful communication. Summarizing, in planning a radio system, one should think communications and not electronics, and radios should be located so as to provide the basic functions required to maintain the daily mining plan and compensate for changes and breakdowns.

Status of Radio in the Mining Industry

Had the need arisen 20 years ago, the mining industry, like the motion picture industry, utilities, petroleum industry, railroads, and forestry service, would have been allocated a special band of frequencies for its individual use. However, up until recent years, the needs of the mining industry did not commit us to any action and we were subsequently relegated to a Special Industrial Band shared by nine classes of users, namely: farmers and ranchers; heavy construction; building construction; manufacturers, specialized trade activities; general service activities; engineering service, geophysical and geological; miscellaneous public facilities; and mining and ore benefication.

In 1957 it was proposed that the Special Industrial Service be broadened to include all business services, and it was at this time that the mining industry, together with the American Mining Congress and other interested users in the Special Industrial Service, began a united action to protect these vital frequencies from being over-crowded from other sources. As a result of this work, the Federal Communications Commission allocated additional frequencies to a new Special Industrial Group and also limited the number of users.

In the future we can foresee improvement of mining radio in three general areas: they are, 1) through increased use of radio to achieve greater mining efficiency and safety, 2) assistance by regulatory bodies to provide more frequencies, and 3) technological improvements in radio equipment. Under 1), if radio is to become more effective in the mining industry, a system for more efficient message transmission must be developed.

As far as regulation improvements go, we would expect the FCC to develop an electronic system which could immediately determine the frequencies available to any new user from a frequency and geographical

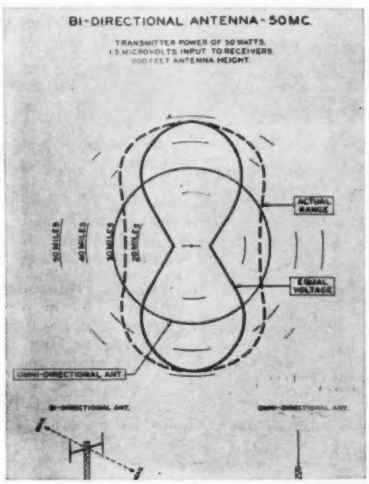


Fig. 2. A longer and narrower range is obtained using a bi-directional antenna as compared with an omni-directional antenna

standpoint. This could eliminate the frequency coordinators and speed processing time of licensing. From the technological standpoint, ways to improve radio usage include: 1) developing radios that will operate in higher frequencies than now available, 2) developing equipment that will operate on narrower bands, and 3) improving keyed receivers.

How Two-Way Radio Works

The basic components of a two-way radio system are antenna, transmitter, receiver, microphone, speaker and power supply. A two-way radio designed for use as a mobile unit should be as rugged and compact as possible. The mobile receiver-transmitter is usually installed in a shock-mounted chassis, in some out-of-the-way place in a car, shovel, truck or locomotive. The microphone and speaker are placed inside the car or truck for use by the driver or operator. The mobile antenna is usually installed on the vehicle. One or more higher powered base stations are usually used to provide a voice connection between the base operator and mobile unit. It is possible to operate a base station from a number of remote control points by using ordinary telephone lines and remote control consoles.

A radio wave is generated by passing an alternating current through a conductor in space. Energy radiates from the antenna wire and varies as the square of the frequency of alternating current producing it; hence, to secure an appreciable amount of radiated energy it is necessary to employ waves at fairly high frequency. The attenuation of signal strength over a line of sight distance varies approximately as the square of the distance. Beyond the line of sight distance, a signal drops off even more rapidly *depending upon the frequency*. The higher the frequency, the more rapidly the signal strength drops off and the more it approaches true line of sight performance.

Radio signals are detected, amplified and reproduced by the receiver. All radio waves, regardless of frequency, travel through space at the speed of light, or 300 million meters per second; that is, 186,000 miles per second and can be reflected, refracted, and defracted. It follows then, that

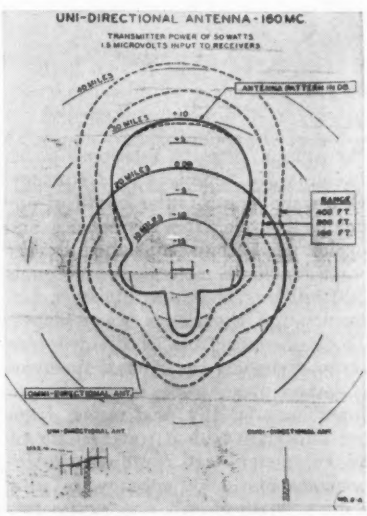


Fig. 3. Result of using a uni-directional antenna system as compared to an omni-directional antenna system. Note that increasing antenna height from 100 to 400 ft increases range only 10 miles

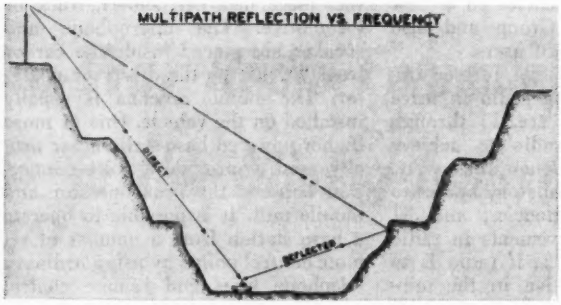


Fig. 4. Multipath reflections become more troublesome at high frequencies because flat reflecting surfaces are larger in terms of radio wave lengths. Rock faces and slabs constitute more effective "zone plates" or mirrors and contribute to dead spots by cancellation

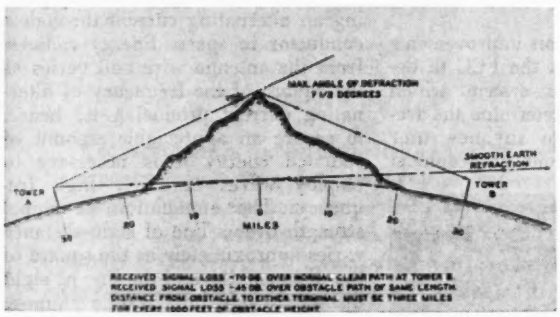


Fig. 5. Obstacle gain technique for 40 megacycles and higher

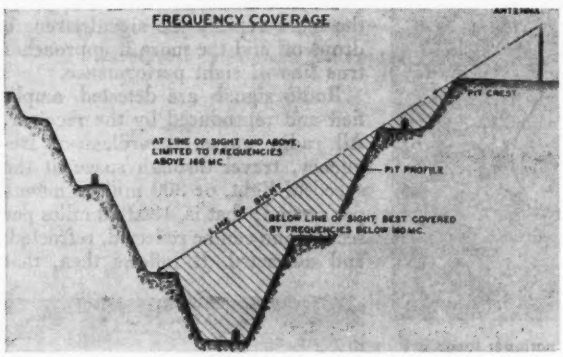


Fig. 6. Frequencies above 160 megacycles are usually limited to line of sight application

there is a definite relationship between wave length and frequency. One wave length is the length of one complete cycle. The frequencies and cycles per second multiplied by the wave length in meters always equals 300 million. Thus, the higher a frequency the shorter its wave length. The radio spectrum is divided into seven divisions, covering frequencies classified from very low (LF) to super high (UHF), and ranges from ten kilocycles with a wave length of 30,000 meters (16.7 miles) to frequencies of 30,000 megacycles with a wave length of only one centimeter.

Frequency Selection Depends on Terrain

Three frequency bands are available for use in the Special Industrial Service; 25 to 50 megacycles, 150 to 160 megacycles, and 450 to 460 megacycles. Each band has different characteristics in behavior and propagation. A fundamental knowledge of some of these characteristics is necessary if optimum performance is to be received and will enable the operator to apply the best available frequency band for the terrain involved.

To achieve maximum performance, it is well to recognize limits of transmission and reception as related to distance, terrain, frequency and co-channel interference. The normal field pattern of a vertical pole type antenna is circular. Radio waves are propagated in all directions equally and parallel to the ground. Close geographical location of two different operators on the same frequency would cause interference with each other, but the use of a cardiod-antenna by one user could eliminate this problem as shown in figure 1. The cardiod-antenna often has a single horizontal reflector to cancel signals in one direction and to reinforce in the opposite direction. When using a bi-directional transmitting antenna as compared to an omni-directional antenna, it is obvious that a longer by narrower range is obtained as shown in figure 2.

The propagation curves shown in figure 3, illustrate the result of using a uni-directional antenna system compared to an omni-directional antenna system. The heavy lines indicate a field strength of 1.5 microvolts per meter at the receiver input. Note how the field strength has increased in one direction and decreased in other directions. The effect of antenna height or range is shown by the dotted line. An increase of antenna height from 100 ft to 400 ft would give only ten miles increase in range.

Radio waves striking objects in their path are subject to both absorption and reflection as shown in figure 4, which shows a mobile unit receiving both a direct and reflected signal. Multi-path reflections become more troublesome at higher frequencies; at 450 to 460 megacycles, flat reflecting surfaces, such as rock slabs or faces, are larger in terms of radio wave lengths and constitute a more effective zone plate or mirror. Reflected signals can cause an echo if the reflected signal path is considerably longer than the direct path. The wave is almost completely reversed in phase when reflected and signal cancellation or dead spots can result. Such bounce characteristics are very troublesome in the 450 to 460 megacycle band.

Effect of Transmission Power on Range

Defraction characteristics of higher frequency radio broadcasts can be used to advantage to gain signal strength at points beyond the horizon as shown in figure 5. In this sketch the defracted signal will be stronger than the direct signal. This technique permits high band penetration below line of sight. It is also indicated in terrain that has many areas below the line of sight, best coverage is in frequencies below 160 megacycles. Frequencies above 160 megacycles are usually limited to line of sight application as shown in figure 6.

Figure 7 illustrates the shadow effects of different frequency bands.

The inability of the higher frequencies above 160 megacycles to cover the area behind the obstacle is shown as compared to low band coverage.

Very little can be accomplished in attempting to increase range beyond line of sight by increasing transmission power. This is shown in figure 8 where a field strength of one microvolt and 100 watts of radiated power would have a range of 65 miles. Increasing the power 100 times to 10,000 watts would extend the range only about 15 miles. It is obvious that increase in range is due primarily to raising the antenna height.

A phenomenon called "skip" permits long distance radio communications with frequencies below 50 megacycles. Ionospheric layers high in the atmosphere reflect these frequencies back to earth. This is shown in figure 9. Many factors affect skip distance. Some of these are the height and intensity of the reflecting layer, the angle between the radio waves and the reflecting layer, the time of day, and the frequency and intensity of sunspot activity. As most private mobile radio systems are for local use only, this skip effect is usually a nuisance instead of being beneficial to operators.

It follows from this discussion, that for any given operation, a study must be made of the component functions required. This may include the control of shovel-loading, truck, and railroad haulage, dispatching of locomotives, maintenance crews, contact with maintenance people both to and from the shops, from the pits, and emergency situations that arise and must be resolved, usually through rapid communication. To each of these functions the operator must apply the factors listed above so that proper radio equipment can be chosen as related to geographical distances, areas involved, depth of pits, possibly even the symmetry or lack of symmetry of contour of the pits involved, and whether there are intervening hills or valleys in between desired points of communication. In some operations a very simple system could be used, but if each of the mining functions requires its own type of communication coverage, a combination of systems, including relay stations may be developed. However, the simplest system is the one usually chosen to obtain the desired results.

With the above in mind, it is well for us to look very closely at this tool with which we are working and to cast a glance at the future of radio. The mining industry has arrived actively in the game of radio usage somewhat later than its fellow participants and has found itself in the Special Industrial Service, which in reality is a catch-all service insofar as the FCC is concerned. However, we do have a future in radio and a bright one.

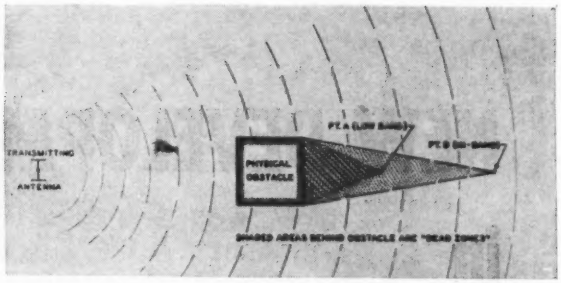


Fig. 7. Inability of frequencies above 160 megacycles to cover the area behind the obstacle as compared to low band coverage

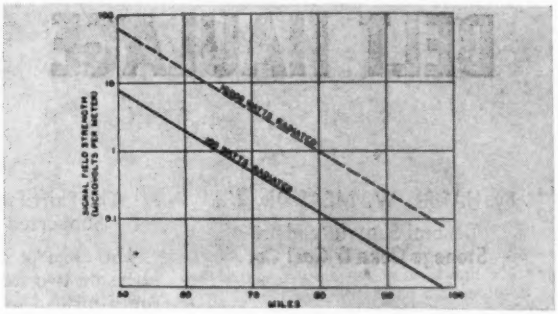


Fig. 8. Increasing power results in comparatively small increase in range over smooth earth beyond line of sight. For example, with one microvolt field strength and 100 watts signal, the range is 65 miles; raising the power 100 times increases range only 15 miles

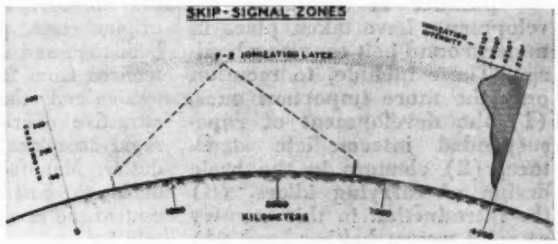


Fig. 9. At heights of about 250 to 400 kilometers (156 to 250 miles), F-2 is the principal reflecting region for skip effects on the 30 to 50 megacycle low band. Intensity and duration vary daily, seasonally and over the ten-year sunspot cycle. The last high point was in 1958

Users Organization Promotes Better Regulation

We know that the industry's radio needs will increase, and as they expand, we will have to stand up for the principles which we think are correct and proper in legislation and regulations. We have organizations to help us to do this—the American Mining Congress, the American Iron Ore Association and many other user groups are joined in the Special Industrial Radio Service Association which, with other individuals concerned, are active in the promotion of better regulatory proposals. The newly formed Special Industrial Radio Service Association fills a prime need for supplying frequency coordination and at times makes itself felt in the regulatory system. SIRSA also serves its membership by presenting, through regular publications and releases, proposed actions of the FCC and the import of such possible regulations on the Industrial Service.

In the past five years, the Special Industrial Radio Service has come of age. We have seen the formation of frequency Coordinating Committees, the United States, including Alaska and Hawaii, sectionalized into regions for ease of coordinating administration by lay personnel of the varied industries and most importantly, we have seen the mining industry take its position together with the petroleum industry, liquefied petroleum gas distributors, agriculture, sand and gravel operators, ready-mix contractors, general contractors and many others in the continuing struggle with other Services to retain and improve frequency allocations and usage.

NEW DEVELOPMENTS in BELT HAULAGE

By HARRY W. MEADOR, JR.
General Superintendent
Stonega Coke & Coal Co.

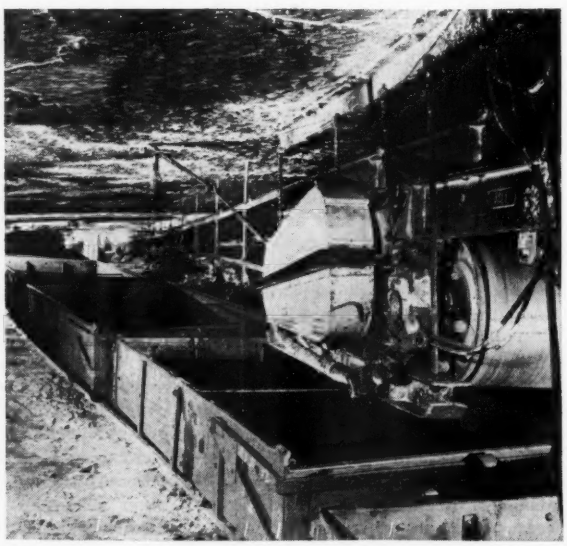
DURING the past decade, a number of significant developments have taken place in underground belt conveyor haulage. These include, to mention only the more important ones, (1) the development of rope-suspended intermediate structure, (2) changes in the basic design of carrying idlers, (3) the introduction in this country of solid woven belting, and (4) the development of conveyor equipment to serve as a link between a continuous miner and a butt entry conveyor.

The Shift From Rigid to Rope-Supported Belt Equipment

The concept of mounting carrying idlers on two stationary, parallel wire ropes instead of on rigid framework was first introduced to the domestic coal mining industry in 1955. Lower original cost, plus the savings in both time and money that could be realized from faster installation, extension and relocation, made this an attractive offering and lead to its rapid acceptance by the mining industry. Manufacturers estimate that during the past year roughly 90 percent of the new conveyor equipment sold for panel and butt entry haulage was of the rope-suspended type. The shift from rigid to rope-supported structure for main or secondary haulage has progressed more slowly, but current sales of rope equipment are reported to exceed those of rigid structure.

Change, especially change at such a rapid pace, is almost sure to have its price. The change from rigid to rope-supported intermediate equipment was no exception. For some, the cost in terms of belt damage and reduced belt life was fairly high. Eventually, manufacturers and users came to realize that while this equipment was easy to install, it could not be done in a careless or haphazard fashion. It was found that cable tension had to be maintained at 5000 to 6000 lb. Users learned that there were practical limits to the spacing of cable anchors, intermediate supports and carrying idlers. It was also found that proper leveling and aligning of equipment was as important with rope as with rigid structure.

Much progress has been made, but many questions are still unanswered. The location of carrying idlers with relation to the supporting ropes was the subject of a lengthy discussion at a recent meeting of the Underground Haulage Committee of the American Mining Congress. Proponents of the "low-rope" construction claim that if the carrying idlers are hung below the rope they can easily be knocked out of alignment by large, in-transit lumps. They also point out that there is greater safety when handling men and supplies if the idlers are mounted above the cable. Those who favor the "high-rope" design point to the greater amount of vertical adjustment that can be provided in the intermediate cable supports with this design. The controversy is by no means settled, but at the moment the tide appears to be running with those who favor the "low-rope" design.



Many operations use belt conveyors in conjunction with main-line track haulage

Idlers—Should Lateral Movement Be Permitted?

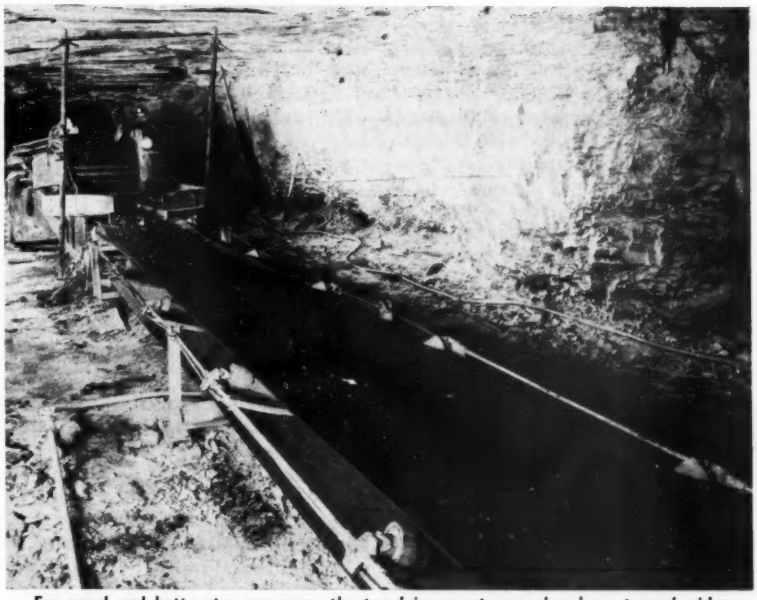
Three basic types of carrying idlers are being used in conjunction with the wire rope side members: (1) the regular three-roll troughing idler, (2) a flexible two-bearing suspension idler and (3) a hinged, three-roll idler. The first two types are mounted on a stand or cradle that is designed to restrict lateral deflection of the supporting cables. The mounting for the third type permits movement in both the horizontal and vertical directions. This design permits the concentrating angle of the troughing rolls to change with changes in loading. The question of whether or not to permit lateral movement of the supporting cables is another which is as yet unsettled.

The hinged, three-roll idler was first introduced in 1955. The carrying idler assembly consists of three, dead-shaft welded steel rolls of equal length attached to a cable clamp or support stand. The center-roll shaft is vertically hinged at each end to the wing-roll shafts by riveted roller-chain links. As weight is imposed on the idler, the wire ropes to which it is attached flex inward and down. This action deepens the trough of the idler and increases the carrying capacity of the belt. The manufacturer claims that this design is easier on the belt because it cushions the impact that normally develops when large lumps pass over the idler. Critics insist that the intermediate cable supports tend to "walk" and become misaligned when lateral movement of the supporting cables is unrestrained.

The development of the flexible, catenary idler predates the introduction of the rope conveyor by several years, but has found its greatest application on that type of equipment. This idler consists of a Neoprene-covered steel wire rope with swaged steel shank ends; two sealed, precision bearings and a series of Neoprene discs molded to the cable. The manufacturer claims that the idler provides a catenary-shaped trough for the belt which helps to center it, adjusts automatically for variations in load and provides a cushioned ride for the material. Some users feel that good cable shaft life for this type of idler depends too heavily upon the maintenance of good idler alignment and upon uniform contact pressure between belt and idler across the full belt width. It is the writer's understanding that recent changes in the design of the idler should eliminate this criticism. Other users have complained that the discs sometimes wear unevenly or eccentrically. Such wear is generally caused by uneven or incomplete contact between belt and idler across the full width. Use of more flexible belting and elimination of abrupt changes in grade should improve this situation.

Another flexible catenary idler which features a pair of molded rubber spirals instead of a series of rubber discs has recently been placed on the market, but reports on its performance were unavailable.

Both of the flexible idlers described above have life shafts in contrast to conventional steel idlers most of which are of the dead-shaft type. One manufacturer makes a flexible idler which features a steel cable as a dead-shaft. Metal or rubber discs are individually mounted on the shaft.



For panel and butt entry conveyors, the trend in recent years has been toward wider belts and higher speeds. The majority of the equipment currently being sold is 36 in. wide and is designed to operate at speeds of from 450 to 600 fpm

Each turns on its own bearing. This design overcomes many of the shortcomings of the integrally-molded, live-shaft type, but is somewhat more expensive due to the greater number of bearings required. To date, its use has been limited to above-ground installations.

The three flexible idlers and the link-connected three-roll idler described above are all equipped with self-lubricating, precision bearings. The conventional three-roll idlers used on many rope conveyor installations have precision, automotive-series, roller bearings. Some of this latter type have provision for periodic relubrication.

"High-rope" or "low-rope," rigidly supported or flexibly-mounted carrying idlers, flexible shaft or rigid shaft, live shaft or dead shaft—these are but a few of the problems that still exist in the field of underground conveyor design. The existence of such uncertainties is the price industry



Considerable effort has been directed in recent years toward the development of a conveyor or series of conveyors to handle material from the continuous miner to the butt entry haulage system. Results of this effort include the bridge and extensible conveyor

must pay for progress.

The writer makes no claim that all sides of the aforementioned issues were fairly or thoroughly covered. Information on these subjects is hard to gather and, as is the case in most controversies, opinions are far more abundant than facts.

Equipment to Link Miner and Haulage System

Considerable effort has been directed in recent years toward the development of a conveyor or series of conveyors to handle material from the continuous miner to the butt-entry haulage system. Results of this effort include such equipment as bridge conveyors, extensible conveyors and articulated conveyor trains. All are designed with one basic purpose in mind—the combination of maximum flexibility with the utmost continuity of operation. Design features include: self-propelled conveyors or terminal components, automatic belt storage, quick extension and retraction, and ability to turn corners. Many of these units are currently in use. Manufacturers feel that many more could be used if greater attention were given to the development of mining plans to fit the equipment rather than attempting to fit equipment to existing plans.

Trend Toward Wider Belts, Higher Speeds

For panel and butt-entry conveyors, the trend in recent years has been toward wider belts and higher speeds. The majority of the equipment currently being sold is 36 in. wide and is designed to operate at speeds of from 450 to 600 fpm. This is in marked contrast to the 30 in. width and design speeds of 250 to 400 fpm that were so popular 10 to 15 years ago. The higher width-speed combination is necessary in order to provide the surge capacity needed for high-speed dumping of large capacity shuttle cars. Surge loads of from 12 to 15 tpm are not uncommon in the higher seams. Peak loads are usually of from 15 to 30 seconds duration and are often followed by intervals of several minutes during which no load is applied.

Manufacturers and users agree that this is a highly inefficient use of equipment. For this reason a great deal of attention is being given to various feeding devices which can receive the coal from shuttle cars at a rapid rate and transfer it to the belt over a longer period of time. This would permit simultaneous dumping and layer loading by several cars on a narrower or slower belt.

Up to 48-In. Belts Being Used for Main Haulage

Some 36-in. conveyors are also being used for main entry haulage, but most of the larger mines have gone to 42 and 48-in. belting for this purpose. Belt speeds of 500 to 750 fpm are used to achieve capacities of 1200 to 1500 tph. Conveyor lengths up to 4500 ft are not uncommon. Power requirements vary from 200 to 400 hp, depending upon length, lift, speed and loading rate. Many such units are powered by wound rotor motors with step starting. Some users have gone to dual motor drives for the larger units, but tandem drives have been used successfully up to 350 hp.

Some mines employ these larger conveyor units in conjunction with main line track haulage. In such cases, some storage capacity between belt and mine cars should be provided in order to permit brief interruptions in transfer.

Solid-Woven Belting for Adverse Conditions and Improved Safety

Solid-woven, plastic-impregnated belting was developed in Great Britain and was first introduced in the mines in the United States about five years ago. During the past several years, it has gained fairly wide acceptance in several major mining areas. Its acceptance was due in part to the enactment of state mining laws which required or encouraged the use of fire-resistant belting. More important than this, however, was the belt's ability to perform outstandingly in situations where impact, abuse and accidental damage had previously been major causes of belt failure. Average life of conventional rubber or Neoprene belting under such conditions was often under five years. Much of the solid-woven belting currently being sold is destined for use in mines where these conditions prevail.

In mines which have favorable seam conditions and a good installation and maintenance program, the average life expectancy for rubber belting may be from 8 to 12 years. Failures are, for the most part, the result of aging and abrasive wear. The use of solid-woven belting in mines of this type has been somewhat limited. Some mines have purchased short lengths for test purposes, but few are buying in large quantities. Most such companies take the position that solid-woven belting has not been used long enough to make a fair appraisal of its long term resistance to wear, aging and mildew.

Growing Interest in 35° and 45° Carrying Idlers

Much of what has been said heretofore dealt with the evolution of equipment design and mine planning during the past five or ten years. Some indication was also given of the direction of those trends and developments that are as yet unannounced; perhaps they are still too nebulous to have aroused general interest or attention.



An estimated 90 percent of the new conveyor equipment sold for panel and butt entry haulage in 1959 was of the rope-suspended type

In the near future the industry is almost certain to see a growing interest in the use of carrying idlers with 35° or 45° troughing angle. Manufacturers of above-ground equipment are currently giving them serious consideration. One major manufacturer will shortly announce a new line of heavy duty 35° idlers. Several large coal companies are trying idlers of this type on short conveyors in their preparation plants, and one is reported to be equipping a slope belt with 45° idlers. They appear to be attractive for underground use because they are a means of providing greater capacity without increasing belt width or speed. They may also help to reduce the cost of spillage clean-up, an expense which approaches $30,000 per year for some mines.

One equipment manufacturer reports working on a crowned return idler. Preliminary trials indicate that training of the return strand of belt, long a problem on underground conveyors, is much improved where these idlers are used. When used on a rope conveyor these idlers would be suspended from the side cable rather than on the cable support stands.

Belt manufacturers are also currently working on improved multiply and solid-woven belt constructions. Attention is being given to:

(1) Evaluation of new synthetic fibers
(2) Development and evaluation of new rubbers and plastics
(3) Improvements in fabric weave design which provide more efficient utilization of material capabilities

The Forgotten Link

Transportation has often been the forgotten link in the coal production chain—but as mining machines get larger and mining becomes more concentrated, more attention will have to be paid to this link. It is to the credit of the belt manufacturing industry that it has been alive to the needs of the mining industry and kept at least abreast of its demands.

An essential to all business today is continuous improvement of its product. This involves a constant drive for technological betterment which boosts production, or reduces cost of operation.

The coal mining industry must have a greater understanding of the contribution automation will have to its progress.

The coal industry must have improvement of methods that are in step with the times.

PROGRESS IN PREPARATION PLANT AUTOMATION

(Continued from page 79)

An Accurate Instrument to Read Moisture is Needed

There are two instruments urgently needed by the coal industry:

1. An accurate and reliable moisture meter. This is needed to control the heat dryers and to know the moisture content of the coal as loaded. In the years the author has been connected with coal, the majority of complaints have been on moisture. In this day when coal is sold on a delivered Btu basis, an accurate instrument to read moisture would be most welcome.
2. The Dutch State Mines has developed an instrument, or instruments, to read ash in a moving stream of coal. No doubt before too long, this instrument will make its appearance in the U. S. coal fields.

Automation is not possible without instrumentation. The coal industry has used the old amp meter to the fullest extent. These meters are installed on belt conveyors, flight conveyors, pumps, and all heavy duty equipment. They are flush-mounted on the panel board in full view of the operator. With them it is possible to keep all pumps, conveyors and equipment operating at full capacity. The meters have proved very helpful in indicating trouble and giving the maintenance men an opportunity to make the necessary corrections before a failure occurs.

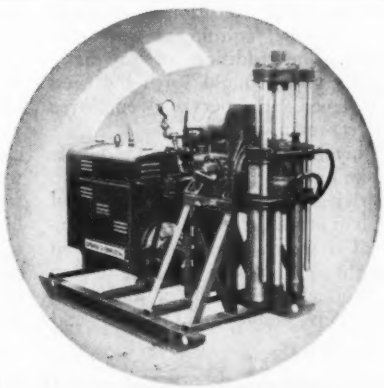
Limit switches are used extensively on belts to keep them within their limits of travel. Bin controls are used on all bins. Sump levels are controlled by probes to start or stop the pumps, or sound an alarm in order for the operators to make the necessary corrections.

All bearings in the plant are automatically lubricated by a high-pressure grease system. Each bearing receives its proper amount of grease. This is accomplished by regulators on each line which control the amount of grease to each bearing.

With the advent of automation in the coal mines and preparation plants, the need for technically trained men and skilled technicians for the repair and operation of this equipment is obvious. Instrument men in particular are in demand as more and more instruments are being used.

It might be said that the industry has traded in the pick and shovel for electrical gadgets, meters and screw drivers.

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Foremen and Supervisory Training

By JAMES P. LOGAN
Executive Vice President
Mountain States Employers Council, Inc.

SUPERVISORY training was born of necessity—the necessity that came about as a result of World War II. American industry, as unprepared as our military defenses, was called upon to meet production schedules way beyond any it had anticipated. It was necessary for plants of all types to add hundreds of thousands of workers to their forces in order to meet these demands. Additional buildings and additional equipment were also needed. The addition of so many workers also brought forth the need for foremen and supervisory employes to direct them.

Many workers came into the plants to take on jobs in which they had no experience whatsoever. An additional problem arose through the great number of women workers who had been brought to the plants in order to step up production. To direct and train these new employes, foremen and supervisors had to be brought up from the ranks of present employes or hired from the outside. There was little or no time for job training because the war tempo demanded immediate production.

Men totally unprepared and without previous supervisory experience were moved into the new supervisory jobs. They were men with good work experience, loyal and patriotic, but without knowledge of supervision.

Some performed exceedingly well; others probably fair, but many failed because they knew little of their supervisory duties and did not have sufficient time to prepare for them. Failure was not their fault. It was industry's fault, and industry accepted full blame and started to do something about it. Some of the larger plants had had supervisory training over a period of years, but now even their training had to be stepped up to meet the war demands.

Training for supervisors was put on a more solid basis, and real progress has been made over the years since that time.

Coordinating the Work of Others

Many believe that the starting point in foreman and supervisory training should be in the original choice and selection of employes, because from these employes future supervisory personnel should come. Companies, therefore, looked very carefully at their methods of recruitment, their source of labor supply, the interview, the choice and selection, and the morale. The next step was to set up a job description for the supervisors in the same way you set up a job description of any place in your plant. They outlined the basic educational needs, the craft or job skill, the production requirements, the way in which the department where the supervisor was going to work fitted into the other departments, and the staff personnel he had to contact.

Industry found that many of its loyal employes did not care to jeopardize their seniority standing by moving into supervisory jobs. Some of them were frankly afraid that they would be unable to do the job—they doubted their ability to handle people. They doubted their ability to keep people working as a team, and above all, this was a big step into a new field where they had little or no knowledge.

What does the average man have to do when we move him into a supervisory position? Instead of being responsible for just his own work and his own production, he is made responsible for the activities of many.

Some of the new jobs which the worker has to do when he steps into supervision are listed below.

Maintain discipline
Assign duties
Listen to grievances
If there is a union shop, handle problems with the shop steward
Watch safety
Watch production
Keep up employe morale
Listen to personal problems
Train some employes in their work
Keep department records
Select new employes, in some cases interview them after they have been screened by the personnel department
Above all, get and keep the group working together as a team

His job now is to coordinate the work of others. He also has the job of fitting his particular department into gear with other departments of the company.



The job of the supervisor is to get people working together

Must Have Ability to Handle People

Although there are many definitions of a supervisor, one of the simplest and one that perhaps best describes a supervisor is the following: "*One who gets things done through others.*" If the supervisor isn't doing this, he isn't doing his job.

We are exceptionally careful to see that persons who handle the equipment and the care of machinery in our plants are qualified. Skilled workmen working on maintenance, who have spent years at their trade, may almost know from listening to a machine the problem they face in its maintenance and repair.

In the case of supervisors, we are placing them in charge of the most complicated machine ever known—man. No two are alike—no two have the same problems—no two have the same approach. No one is able to predict just exactly how an individual will do under certain circumstances.

The job of the supervisor is to get people of unequal qualifications working together. He has to have all of the training and ability and more than the skill of the person responsible for the operation of the machinery in our plants. Many skilled workmen have failed because of their inability to handle people. They had the desire; they had the initiative; but they just did not have the capabilities.

There are at least four selfish reasons why we should provide supervisory training for our employes before they are called on to do the job. The first is to give a man the opportunity to know something about the job before he has to take over. The second is to give him adequate preparation so that he can advance further with the company and be able to fill jobs higher up in the organization. The third reason is to enable him to build better morale among the employes; fourth, to get better production in order to meet competition.

Supervisor Must be Able to Communicate

Training can be very simple or it can be complicated. Most organizations of any size are endeavoring to do training of some type. It should be designed and fitted to the needs of the individual supervisors in the organization.

The first thing in training is to know the employes better, to know those who have a desire to advance and at the same time have the ability and also to know those who are willing and anxious to do extra work in order to prepare themselves for the job ahead. Generally, most companies try to bring supervisory employes along gradually. For example, a man might serve as leadman and then be given a chance to serve as supervisor or foreman during vacation or at other times when regular supervisors are absent. They should not be left on their own; rather, somebody with experience who is willing and able to help them should be close by. Their work should be appraised and the employes counseled as to just where they fall down and what they can do to improve.

Supervisory employes should be encouraged to take courses for supervisors at the local level. These may be made available to them either through opportunity schools or through night courses offered by the universities in the locality.

One of the best courses a supervisor can take is one having to do with communications. Here he will receive considerable information on how to give orders, how to use simple language, how to let the employe do some of the talking, how to develop ability as a good listener. Still another course might help him in interviewing and hiring. If the company has a labor agreement, all the supervisors in the plant must certainly be made aware of just exactly what the labor agreement contains. His counterpart—the shop steward—has a good knowledge of this.

Supervisor is Key to Success

The supervisor must be a supervisor in more than just name. He has to know that the company intends to back him up and that he is recognized as a very real part of management. The supervisor is the key to the success of any business. He is the one the workers in the departments look to for leadership and inspiration. He represents the policies and practices of the company more directly than any executive in the organization. He knows the employes and their desires better than anyone. He knows their good points and their bad points. He knows their attitudes. All of this comes naturally because of his close contact with them on a daily basis.

Regardless of whether the organization is large or small, some type of training can be set up both for present supervisors and those training for supervisory positions in the future. If the organization is not large enough to have a special person meeting and counseling with them, the most competent foreman and supervisor can be used effectively for this. Meetings should be scheduled regularly and all of the supervisors should help in solving the plant problems. It gives them confidence in their ability, but also gives them experience which they would not gain except through years on the job. The writer believes it was Henry Ford who said that "experience is the best teacher, but by the time a man has the best experience he is too old to go to work."

Training Can Help in Battle Against Competition

Today production costs are increasing because of increases in wages and materials. This is going to make supervisory training a "must." Competition from organizations in our own country and organizations outside our own country is going to force us to do a better job. A better job is going to have to be done by everyone—the workers, the supervisors and the management, but on the supervisors will fall the job of getting better and more economical production out of the workers.

An August 4, 1959 issue of a Denver paper carried a news item that American manufacturers had priced themselves out of 16 million dollars worth of business in a South American power project designed and supervised by a Denver firm. U. S. firms bidding on supplying this material won jobs for only minor pieces of equipment such as water pumps and transformers. Major items such as generators, transmissions and electric motors all went to foreign competition. On one item the lowest U. S. bid was more than 300 percent higher than the winning Japanese bid. Japanese firms won all the contracts on major electrical equipment.

The author recently heard a major American distributor heap great praise on the superiority of a Japanese camera. He stated it was better than anything available on the American market, and that it could be sold for one-third the price of its American counterpart.

It is an odd situation to see America falling behind and failing to get business on items that have been developed, researched, and manufactured originally in this country.

Everyone has a stake in the production and competition job that lies ahead. The American worker through the foremen and supervisors has to realize that their future and the future of the country depends upon the ability to produce better and more economically. It is my belief that well-trained foremen and supervisors can do much to aid industry in this highly competitive market.

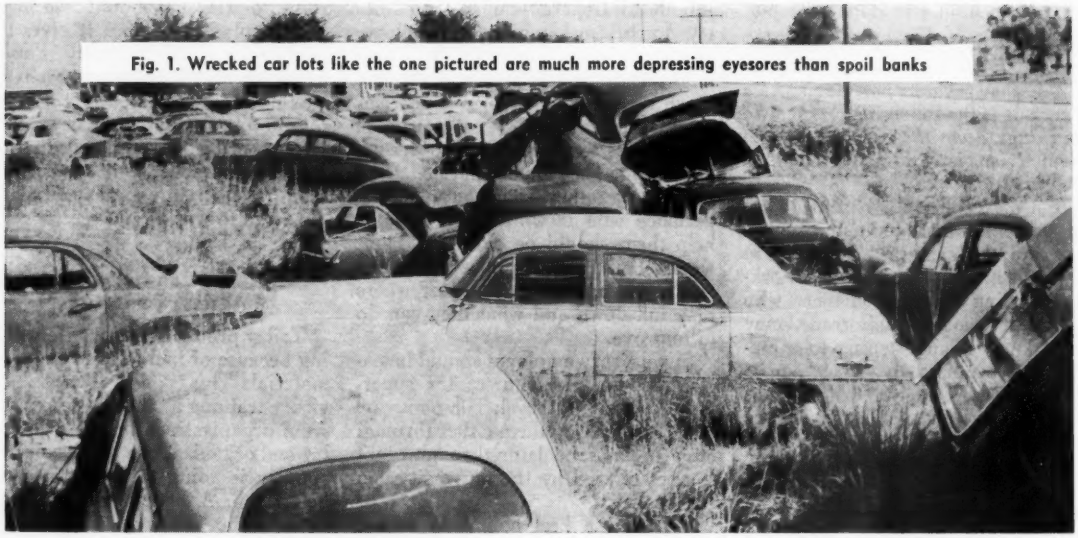


Fig. 1. Wrecked car lots like the one pictured are much more depressing eyesores than spoil banks

LAND RECLAMATION—Part I

The essence of this report is not anti-reclamation but a brief directed against compulsory reclamation. Six states have laws requiring coal operators to reclaim or rehabilitate their spoil banks. Part I presents a keen analysis of the six mandatory reclamation acts and delves into the effects purportedly due to stripping and the benefits attributed to compulsory reclamation. The final portion of this report, scheduled for the October issue, will point out some of the things the coal industry can do to alleviate the ever present threat of legislative reclamation

By WALTER H. SCHOEWE

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State Geological Survey of Kansas
University of Kansas

THE increase in surface mining of coal since about 1915, with its accompanying development of spoil banks and consequent withdrawal of land from normal premining land use, has created a problem of major concern to some individuals or groups of individuals. As a result, periodic attempts have been made and still are being made in the various states where coal is mined by the stripping method to enact legislation requiring coal operators to reclaim their spoil banks and put them into profitable use. That the problem has become national in scope is evident from the recent request of two U. S. Congressmen asking the Department of the Interior to undertake a complete study of spoil banks and to submit a report to Congress within two years with recommendations as to what should be done with them.

Because a spoil bank problem has been created and confronts every strip coal operator, the following review or analysis of spoil banks has been undertaken especially as it applies to Kansas. The principles involved and discussed are applicable, however, to every state where coal is mined by stripping. It should be clearly understood at the beginning that the thesis of this article is not anti-reclamation but rather a brief against *mandatory* reclamation.

Overemphasis of the Spoil Bank Problem

Considerable overemphasis is directed to the spoil bank lands. In Kansas approximately 32,000 acres or about 50 sq miles constitute the spoil bank lands. This area in comparison with the total land area of the State (82,113 sq miles) is only 0.06 percent of the total Kansas area, a percent entirely insignificant. What is true for Kansas also applies to the other states where coal is mined by the stripping method. In Ohio where the spoil bank area is the greatest, spoil banks occupy but 0.58 percent of the State's total area. In Illinois "the total potential strippable land in the State is not more than one-half of one percent of the total land area,

and less than one-fifth of this is high-grade agricultural land" ("Reclaiming Illinois Strip Coal Lands by Forest Planting," by G. A. Limstrom and G. H. Deitschman, Ill. Agr. Expt. Sta. Bull. 547, p. 201). Percentages of spoil bank areas to total state land areas are listed in table I.

Mandatory Reclamation Requirements

Although there is a feeling among a few that strip mining of coal should not be permitted at all, the vast majority, including coal operators, conservationists, and advocates of reclamation, are agreed that coal mining by the stripping method is not only practical and economical but that it is also entirely proper and should not and must not be curtailed. Furthermore, conservationists and reclamationists are also of the opinion that rules and regulations reclaiming spoil banks should never be of such a nature as to create an unreasonable and unrealistic burden on the coal operator. Currently only Indiana, Kentucky, Maryland, Ohio, Pennsylvania, and West Virginia have laws requiring some form of reclaiming spoil banks. Most of the acts in force are similar, differing mainly in the amount deposited as surety or posted as bond for the purpose of assuring the state that reclamation of the spoil banks will be carried out as prescribed by law.

License fees and bonds. In each of the six states, the coal operator is required to have an annual license to strip mine coal. Table II presents data regarding license or registration fees for the six states.

In addition to the annual registration or license fee, each coal operator is required to post bond or render surety in the form of a deposit for the purpose of assuring the state that reclamation of the spoil banks will be carried out as prescribed by law.

Reclamation requirements. In the states where reclamation is required, the spoil banks have to be graded to a more or less rolling topography and isolated peaks leveled off to a level surface 15 to 20 ft wide. Where the reclaimed spoil bank land is to be used for forests or the planting of trees, or will be in sight of public highways, the land has to be graded to a pleasing appearance and where used for farming, graded so that farm machinery and implements can be moved over the area. Fire lanes and access roads must be constructed in reclaimed areas devoted to tree plantings—lanes to be no less than ten ft wide and spaced not more than 440 yd apart and with no plantings within six to eight ft of each side of the lane or road. The coal face in the last open cut must be covered by no less than one ft (West Virginia) to three ft for bituminous coal and five ft for anthracite coal (Pennsylvania) above the top of the unmined coal. All metal, lumber, roof coal, and pyritic coal as well as pyritic shale and all other mine refuse or debris must be buried or concealed from view. In Pennsylvania and Maryland, which have in general similar laws, backfilling must extend a distance of 75 ft from the boundary line of the right of way of a public road (15 ft in an anthracite area), whereas a distance of 200 ft is required from an occupied dwelling, school, church, or public or private institutional building. The slope of the backfilling must not exceed 45°. Also, all breakthroughs must be sealed off or earth dams constructed in the last pit in order to prevent floods. In general the new topography must be such as to reduce soil erosion to a minimum and prevent the pollution of streams, ponds, and lakes by surface run-off.

In all states except Maryland, which amended its act to exclude planting effective June 1, 1959, the coal operators are required to revegetate the graded spoil bank lands by planting trees, shrubs, grasses, or legumes. All planting must be done within a specified time, usually a year, after mining operations have ceased, grading accomplished, and reclaiming plans submitted by the operator to the proper state authorities responsible for reclamation practices. With the approval of the proper officials and under certain conditions, operators may reclaim spoil bank areas other than those just abandoned and, in Pennsylvania and Maryland, may be released from reclamation entirely by the payment of $60 for each acre of land affected by their operations. In such cases the state will undertake the project of reclamation. Before the reclamation bond or surety deposit of the operator is released, the operator must have requested inspection of the restored spoil bank area by the proper officials, who in turn are then required to inspect the premises within a period varying from one to five years after the request has been filed and either to approve or disapprove the completion as conforming to all requirements imposed on the operator by law. The operator may purchase stock for plantings either from state nurseries or from commercial concerns; if the

Table I. Coal is currently being mined by the stripping method in 23 states, of which six have laws requiring reclamation practices. Chart shows the states and lists total land areas, total spoil bank and soil bank areas in square miles, percent of total land areas, and annual governmental payments to the states in the reserve land program for 1959–1968

State	Total land area, sq miles	Total area, sq miles		Percent of total land area		Annual rental payment obligation for 1959–1968 (U.S.D.A.-CSS-Soil Bank Div.)
		Spoil bank	Reserve	Spoil bank	Reserve	
Arkansas	52,775	7**	729	0.01	1.38	$ 5,564,433
Illinois	55,947	147	539	0.26	0.96	5,938,566
Indiana*	36,205	111	560	0.30	1.54	6,547,040
Iowa	55,986	4	770	0.006	1.37	8,773,904
Kansas	82,113	50.4	1,750	0.06	2.13	13,376,236
Kentucky*	40,109	40.5**	412	0.10	1.02	4,738,207
Maryland*	9,887	1**	109	0.01	1.10	1,175,693
Missouri	69,270	52.1	950	0.07	1.37	8,388,732
Ohio*	41,122	241.8	542	0.58	1.31	5,873,297
Oklahoma	69,283	28	1,856	0.04	2.68	12,392,020
Pennsylvania*	45,045	174.6	381	0.38	0.84	3,766,425
West Virginia*	24,090	32**	60	0.13	0.24	606,544
Other states	Alaska, Alabama, Colorado, Montana, New Mexico, North Dakota, South Dakota, Tennessee, Virginia, Washington, Wyoming—areas insignificant for spoil banks					
United States	2,977,128	854.8	35,035	0.02	1.17	258,469,720

*Mandatory reclamation acts.
**Estimated.

latter, however, the stock must meet with the approval of state officials.

Strip Mining Effects and Reclamation Benefits

Reclamation of spoil banks is desirable and is not an issue to be debated for or against. All good practices of conservation logically and properly demand that all natural resources including land be used to their fullest extent, wisely, efficiently, and not wastefully, carelessly, or unnecessarily. It is questionable, however, whether all spoil banks should be subjected to laws and regulations in order to reclaim them. Nature eventually will reclaim most spoil bank areas, given sufficient time. Other areas by their very makeup or composition will not necessarily become economically productive even though the spoil banks are graded to a more or less rolling topography as required by the several state laws. Certainly, wherever the effects on the land due to strip mining can definitely be proved to be harmful to the general public welfare of the state by creating hazards to life and property, fire hazards, pollution of surface and underground waters, likelihood of floods, and soil erosion on adjacent lands, it is reasonable and proper that all steps should be taken to offset or at least minimize such injurious effects. The purpose of this article, therefore, is not to argue against reclamation but to determine the validity of the claims cited by advocates of legislative reclamation and to determine whether compulsory reclamation is necessary and justifiable.

Right of eminent domain versus private simple fee ownership. The right of eminent domain of a state or other official political unit to appropriate all or part of a spoil bank area to a necessary public use, rendering a reasonable compensation to the owner for the tract, is recognized. The legality of acts of a state or any other public unit, however, requiring a lawful owner (fee simple or holder of patent rights) of a tract of land to reclaim his land or restore it to a more or less original contour is questioned, as such reclamation does not involve a change in ownership to the state or other official political unit, nor does it compensate the owner for the land. That mandatory reclamation is unconstitutional is clearly indicated by the action of the Supreme Court of Illinois in declaring the Illinois Reclamation Act unconstitutional. Mandatory reclamation forces an owner or leaseholder of coal land to engage in a business not of his own selection and thus violates a person's freedom and hence his constitutional rights.

Currently, none of the laws of the states requiring reclamation of spoil banks embody provision for maintenance or upkeep of the leveled, graded, or reclaimed areas after the conditions stipulated in the acts have been met. The laws simply state and outline certain requirements that must be met and provide that if the conditions stipulated are met by the coal operator and approved by the state, the surety or bond is released. The companies, therefore, are no longer subject to the reclamation acts and, if they wanted to, could neglect the revegetated areas, allowing them to revert to a state of wilderness, unprofitable to agriculture, an eyesore to some, and an obvious hazard to life and property. In short, the absence of provisions for continued profitable use of the reclaimed spoil banks in the law is in essence a recognition on the part of the state that privately owned property is not subject to the authority of the state demanding specified usage of the land.

If the state or other legal governing body deems that the reclaiming of the spoil banks is for the general benefit of the public, then let it exercise the right of eminent domain, thereby acquiring the land legally, compensating the owner of the land with a reasonable sum and reclaiming the spoil banks as seems best.

Table II. Registration or license fees, reclamation bonds, and penalties in states requiring reclamation of spoil banks

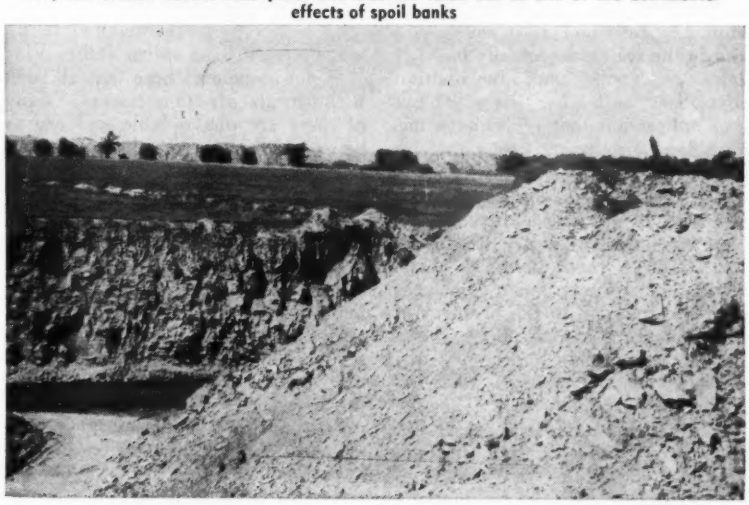
State	Annual Registration or license fee		Bond required reclamation			Penalty for misrepresentation or mining without license, dollars
	Rate, dollars	Minimum acres	Rate per acre, dollars	Minimum amount dollars	Years in force	
Indiana	100	less than 10	200	1,000	10	1,000–5,000
	200	10–24				
	300	25–49				
	400	50–99				
	500	100 or more				
Kentucky	50 plus 10/acre		100–250	100	∞	100–5,000 for each offense
Maryland	50		300	1,200	1	5,000–10,000
Ohio	50 plus 10/acre		250	1,000	2	300–1,000
Pennsylvania	100		300	3,000	5	5,000 maximum
West Virginia	50		500	1,000	1	1,000; imprisonment for 1 year; both

Table III. Claimed effects of stripping and reclamation upon spoil banks

	Effects	
	Stripping	Reclamation
Appearance of landscape	Eye-sore, ugly	Pleasing
Value of land for taxation	Lowers	Restores
Soil erosion	Causes	Stops
Stream pollution	Causes	Stops
Stagnant water	Creates	Eliminates
Floods	Causes	Prevents
Land use for worthwhile purpose	Destroys	Restores
Wildlife	Harmful	Protects, beneficial
Streams, roads, transportation	Obstructs	Restores to normalcy
Inaccessible or isloated land	Creates	Eliminates
Surrounding or adjacent lands	Rendered incapable of production	Rendered capable of production
Health hazard	Creates	Safeguards
Fire hazard	Increases	Diminishes
Danger hazard to people, livestock	Creates	Eliminates
Game preserves or refuges	Unfavorable	Favorable
Parks, recreational areas	Unfavorable	Favorable
Space for airplane runways	Unfavorable	Favorable
Land for housing developments	Unfavorable	Favorable
Income to owner of land	Non-profitable	Profitable
Geologists viewpoint	Asset	Disadvantage

Land use for worthwhile purposes. One of the chief reasons cited by the advocates of mandatory reclamation is that stripping destroys the worthwhile and profitable use of the land and that reclamation should be required in order to restore such land to a condition of profitable use such as pasturage, tree farms, the growing of crops and the like. Currently, rendering the land suitable for agriculture is no longer a pertinent reason for reclaiming spoil banks. As of August 14, 1959, there was a minimum of 22,422,159 acres or 35,035 sq miles (approximately 1170 sq miles less than the land area of Indiana) in the soil bank, land put on reserve or taken out of production for a period of at least ten years, costing the Federal Government annually a minimum of $258,469,720 (U.S.D.A. CSS—Soil Bank Division 9–28–59). For 1960, the U. S. Department of Agriculture has earmarked $756,000,000 ("Down the Rathole," Editor, *Lawrence Daily Journal World*, January 11, 1960) to remove land from production. This should be sufficient to nullify any assertion that reclaiming spoil banks for agricultural use is necessary. Furthermore, according to Secretary Benson ("Benson Wants Wheat Solution," *Lawrence Daily Journal World*, January 2, 1960, p. 6) "the wheat surplus will reach 1.3 billion bushels by July 1" and is "costing us $1,250,000 a day just for storage." This plus the report that the Commodity Credit Corp. budgets nearly $2.5 billion ("Down the Rathole," Editor, *Lawrence Daily Journal World*, January 11, 1960) to remove surplus produce from the market all point to the same conclusion—namely, that spoil bank lands are not required for food production. In 1957 Kansas had 213,000 acres or 333 sq miles in the Conservation Reserve and out of production, owing to Federal Government schemes paying $2,146,000 in annual rental payments and an additional $3,350,000 in cost sharing in establishing permanent vegetative areas. As of March 15, 1958, approximately 174,000 additional acres had been added to the Conservation Reserve Program plus 950,000 acres in the Acreage Reserve Program with an estimated payment of $22,000,000 (The ASC reports—"Kansas Agriculture, 1957–58," Kansas State Bd. Agri., 41st report, Wendell Becraft, 1958, p. 39). Reclaiming spoil banks for agricultural purposes in the six Kansas counties in which coal is mined by stripping is not warranted, as is clearly indicated by a comparison of spoil bank acreage with acres in the Conservation Reserve Program or land taken out of production (table IV). Excepting Crawford County, where the ratio of land in spoil banks to land taken out of production is 1 to 0.75, all counties have more acres in the soil bank than in





Figs. 2 and 3. Spoil banks are not composed of soil but of fragments and blocks of broken or shattered unweathered sedimentary rocks of various sizes and composition—all arranged without any pattern of orientation. Since spoil banks are not made up of soil, soil erosion cannot take place and must be ruled out as one of the detrimental effects of spoil banks

Table IV. Approximate land area and spoil and soil bank areas of southeastern Kansas coal stripping counties as of December 31, 1959

County	Approximate land area, acres	Acres, 1960			Percent of total land area	
		Spoil bank	Soil bank	Ratio of spoil to soil bank	Spoil	Soil
Bourbon	408,960	3,150	23,201	1: 7.30	0.77	5.67
Cherokee	375,680	9,260	10,922	1: 1.10	2.46	3.90
Crawford	382,720	17,415	13,192	1: 0.75	4.55	3.44
Labette	418,560	275	17,439	1:63.4	0.06	4.16
Linn	388,480	1,025	22,688	1:22.1	0.26	5.83
Osage	461,440	725	10,064	1:13.8	0.15	2.18
Total	2,435,840	31,850	97,506	1: 3.0	1.30	4.00

Table V. Acres harvested in spoil bank counties of Kansas in 1937, 1947, and 1957

County	Acres harvested			Change in number of acres harvested. 1937/1957
	1937	1947	1957	
Bourbon	149,233	166,407	138,190	- 11,043
Cherokee	184,902	175,332	168,460	- 16,442
Crawford	173,984	183,800	143,250	- 30,734
Labette	203,379	211,338	137,585	- 65,794
Linn	160,226	152,853	162,680	2,454
Osage	199,397	184,305	182,350	- 17,047
Decrease in harvested acres 1937-1957				- 138,606
Spoil bank area, acres				32,000
Number of acres to be accounted for by other causes than strip mining				- 106,606

Table VI. Withdrawal of rural land in Kansas, 1950–1959, other than spoil banks

Project*	Acres
Soil bank	1,119,876
Federal reservoirs	319,767
Farm yard ponds	55,878
Annexation to cities**	52,936
New roads, increase in width of old roads	24,558
State and county lakes	19,419
Kansas Turnpike	10,000
Military reservations, missile sites, etc.	7,262
Total	1,609,796 (or 2,515 sq miles)

* New industrial plants and private homes outside of city limits not included.

** Total reported by 90 cities out of 174 having a population of 1000 or more.

the spoil banks, a point suggesting strongly that even in the coal-producing counties, spoil bank lands are not needed for the production of crops. Logically no county having any land in the soil bank actually has any claim on spoil bank reclamation whatsoever, as land in the soil bank is an admission that the county has more land producing crops than is desirable.

A survey of the number of acres harvested in the six main coal-producing counties in 1937, 1947, and 1957 (Kansas State Board of Agriculture reports) suggests a somewhat different approach to the problem of reclamation in Kansas. Table V shows that the decrease in acres harvested in 1957 when compared to 1937 amounted to 138,606 acres. That the decrease in harvested acreage is not due primarily to rendering the land unfit for agriculture by strip mining is clearly indicated by the fact that only 32,000 acres constitute spoil banks, leaving thus 106,606 acres to be accounted for by causes other than surface mining. On the other hand, in 1957 when surface mining in Linn County had virtually come to an end and the county thus had its maximum spoil bank area, harvested acres in the County exceeded the 1936 and 1947 number of acres harvested by 2454 and 9877 respectively.

Thirdly, the areas affected by strip mining are insignificant when compared to the areas rendered unsuitable for agriculture by such projects as Federal reservoirs, city, county, and state lakes and recreational parks, wildlife preserves, increasing numbers of military installations such as missile centers or sites, and greatly increased road building programs, including turnpikes and interstate highways with greatly increased widths of right of ways, and areas annexed to cities. The withdrawal of land for various purposes between 1950 and 1959 due to Federal, State, and county projects in Kansas amounted to no less than 2418 sq miles (table VI). It is not contended here that all such withdrawals are unnecessary. Many of them are unavoidable and are to be expected in the rapid development and growth of a progressive state such as Kansas.

Unsightliness or ugly scar effect. Probably the first reaction toward spoil banks is the adverse effect that the rugged terrain of the spoil banks makes on the casual observer. The immediate reaction (primarily a psychological one) is that the operator or stripper should be required to grade or level the ridges and peaks to the original contour of the land. Without discussing the merits of what is or what is not unsightly relative to the spoil banks, it is interesting to note in this respect that there are an unusual number of "eye sores" or unsightly to ugly scars dotting the landscape in almost every community, many of which are situated along main highways leading into the cities and towns and are seen every day by hundreds, perhaps thousands of people. To cite but one case, special reference is made to junked or wrecked car lots (figure 1), which not only have a depressing effect upon the observer but which also occupy much ground suitable for yielding foodstuff. The object here is not to argue against such areas, all of which are the results of worthwhile and necessary developments, even including the depressing car graveyards, but to raise the question whether spoil banks are unusually unsightly or ugly scars among the numerous existing unsightly places dotting the landscape and hence need to be reclaimed.

Soil Erosion

Unless the reclamation acts provide for removal of all top soil before stripping is done and later replacement over the reclaimed graded spoil bank surfaces, (not required by any of the reclamation acts now in effect) no soil erosion is possible within the recently formed and unaltered spoil banks as no true soil is present. Spoil banks are composed of fragments and blocks of broken or shattered unweathered sedimentary rocks—shale, sandstone, and limestone—of various sizes and compositions and all arranged without any pattern of orientation (figures 2 and 3). This broken debris, usually called rubble, mantle rock, and regolith by geologists, is in no sense of the term soil, although it is the parent rock from which soil may be formed by the processes of weathering, erosion, and the action of organisms, plant or animal or both. There is unanimity among those dealing with soils that a substance is not soil until it can grow rooted plants. If, therefore, spoil banks are not made up of soil, then soil erosion cannot take place, and hence soil erosion must be ruled out as one of the detrimental effects of spoil banks. The fact that vegetation of some sort eventually does get a foothold and grow on spoil banks is due to the breaking up of the larger fragments of rock by mechanical and chemical agents into material of soil size and the introduction of organic matter by some means—wind, animals, and man himself. By far the bulk of the spoil bank, however, is still rubble and not soil.

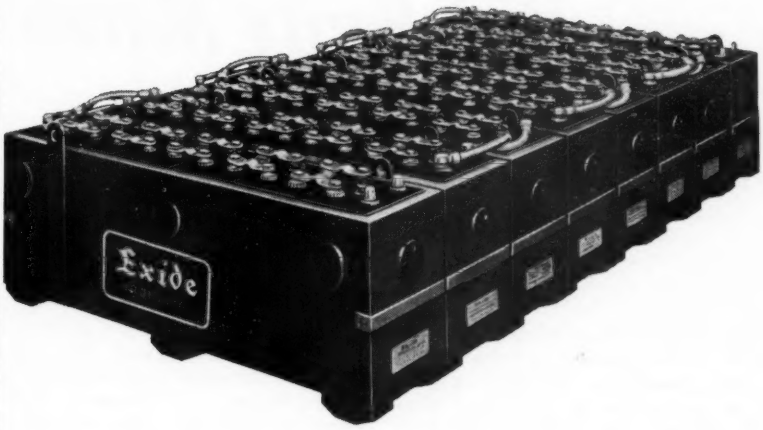
Man's primary concern in soil erosion is removal of soil; that is, loss of soil from a given area. In Kansas many, if not most, of the strip lands have no exterior or through-going drainage but rather are characterized by an interior drainage because the pits are blocked off from the non-stripped land by a lake or pond occupying the last open pit or by an unfilled water or dry depression. Hence, most of the eroded material is kept within the confines of the stripped area.

It should also be pointed out that weathering—that is, the breaking up of the rock into smaller pieces or particles suitable for plants to get a foothold and the first step in producing a soil—is favored in places where the terrain is rugged rather than where the surface approaches flatness or has little relief. This is true because more surface area per unit is exposed in an area of great relief than one where the vertical relief is negligible. Furthermore, the stony or rocky debris of spoil banks where untouched by man is less compact than where heavy machinery has been employed in leveling off the high places and restoring the surface to the contour of the pre-mining surface. Man-made compaction retards weathering and thus the formation of soil that man is striving to obtain.

It should be made clear in this discussion that soil erosion and spoil bank erosion are not synonymous. Soil erosion cannot take place unless soil is present, whereas no soil is required for erosion to take place on spoil banks. As long as the processes of weathering are in operation, gravity is at work, rains and wind prevail, and erosion, or the reduction of the land to a common level, will function. In this connection it should not be overlooked that man is also a very important agent of erosion. The difference between man's activities, such as grading the spoil bank lands, and the normal processes of nature are that man is aiding the normal process of leveling the earth's surface at an accelerated pace. In general, natural processes of erosion are more selective, even though slower, than man's hasty method of filling up low places by the use of the tractor, bulldozer, dragline or other type of mechanical device.

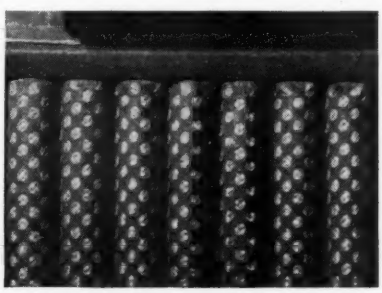
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Preparation of High-Purity Metals

By P. C. GOOD
Supervisory Extractive Metallurgist
Albany Metallurgy Research Center
U. S. Bureau of Mines

MANY of today's much publicized exotic metals, such as zirconium, vanadium, thorium, columbium, and tantalum, have come into prominence only within the last few years. While many people are aware generally that the preparation of these metals is more difficult than that of say zinc or iron, most people, perhaps, do not know exactly what methods are employed or how they differ from the usual sequence of mill and smelter practice. The purpose of this article is to describe some of these operations and to show how the methods affect the purity of the metal and its cost.

At the outset, the metals previously mentioned — zirconium, vanadium, thorium, tantalum, and columbium— must be pure if they are to be fabricated into any useful product. Not only must they be relatively free of metallic impurities and carbon, but also of gaseous impurities such as hydrogen, oxygen and nitrogen. The reason for this is that most of these metals are extremely sensitive to very small quantities of such impurities. For example, the presence of nitrogen to the extent of only a few hundred parts per million—as little as five hundredths of one percent—in vanadium will change it from a soft malleable metal to a material so hard and brittle that it cannot be machined, shaped or formed in any way.

Metals Easily Contaminated During Reduction

With individual variations, the same is true of the other metals mentioned and many more. Not only are these metals sensitive to atmospheric gases, but both the metals and their compounds have a great chemical affinity for the stated impurities. The slightest contact with moisture, the atmosphere, or many of the usual materials of construction during the reduction or melting stages results in the immediate contamination of the metal and renders it worthless.

These are factors that frustrate the researcher on high-purity metals, but this frustration goes beyond him to the engineer who needs metal of a certain specification if his rocket is to function. It extends further to the miner who finds it difficult to understand why the oxide that he sells for a few dollars a ton unit, when processed to some exotic metal, is worth $50 or more a pound.

Some of the methods used by the Bureau of Mines at Albany, Ore., to eliminate or minimize the impurities in these active metals have been developed so recently that they are not yet applied commercially. Nevertheless, the principles in many cases have been used for some years in the commercial production zirconium and titanium by the Kroll process.

To illustrate these methods, two methods of preparing ductile, high-purity vanadium will be described which will show the type of approach and the nature of the equipment that it is necessary to use. The problems to be solved in preparing these more exotic metals are quite difficult; more so than those encountered in standard practice, and the necessary equipment is expensive to build, maintain and operate.

Effect of Oxygen on Ductility of Vanadium

Preparation of high-purity vanadium metal starts with vanadium tetrachloride, a heavy brown liquid which boils at 148.5° C. It may be prepared by passing chlorine gas over

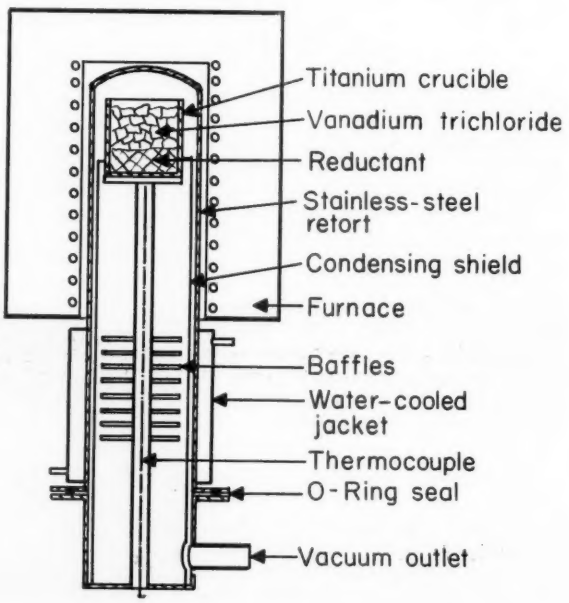


Fig. 1. High vacuum reduction-distillation furnace used in preparation of high-purity vanadium

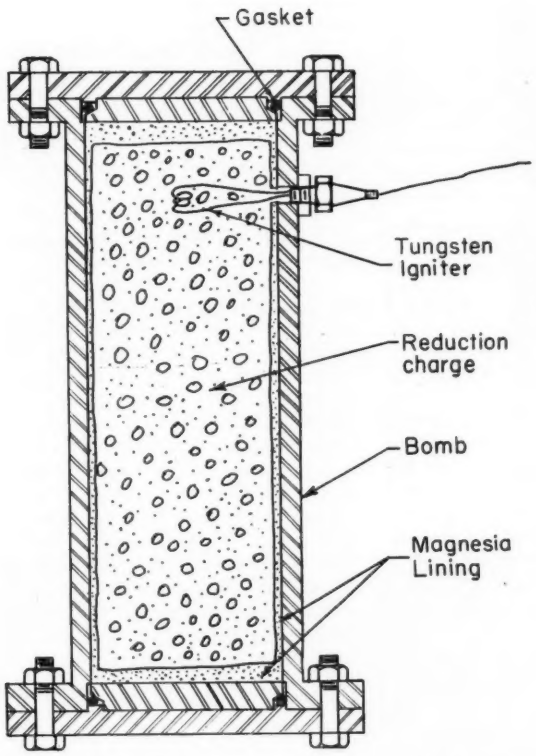


Fig. 2. Bomb reactor for carrying out direct reduction of a metal compound with an active metal

a mixture of vanadium oxide and carbon or over vanadium carbide at red heat. This is done in silica equipment to avoid contaminating the chloride with metallic impurities resulting from the violent corrosive action of hot chlorine gas. The vanadium tetrachloride prepared in this manner invariably contains a small percentage of another liquid compound of vanadium, vanadium oxychloride. This compound contains oxygen, and if permitted to remain, will add so much oxygen to the vanadium metal that it becomes too hard and brittle to use. The boiling points of these two compounds are so close together that they cannot be effectively separated by distillation.

Fortunately, vanadium tetrachloride is slightly unstable and on prolonged boiling it decomposes to vanadium trichloride, an inert, nonreactive solid that is essentially oxygen-free. Upon drying, the residual impure liquid vanadium chlorides pass off, leaving the trichloride in the form of a dry, crystalline powder. In this manner, the problem of preparing a starting compound for the reduction to metal has been solved, and because of the sequence of operations through which it has passed, it is largely free of impurities, principally oxygen and nitrogen, which affect the ductility of the metal.

Other purification techniques are used with other metals; for example, the nonvolatile oxygen-bearing chloride of zirconium is separated by subliming zirconium tetrachloride from it. In the case of columbium, in which both the desired and the oxygen-bearing chlorides are volatile, a very carefully controlled distillation is necessary to eliminate oxygen from the chloride.

Elaborate Reduction Furnace

From the time vanadium chloride is formed in the reactor, it must be rigidly protected from exposure to the atmosphere through the drying and reduction steps. Although it is relatively inert, atmospheric moisture will react with it to add a small amount of oxygen, and for this reason, rather elaborate precautions must be taken to handle, transfer, and store the material under an inert atmosphere, usually of argon or helium gas.

Vanadium trichloride is reduced in the complete absence of air using either high-purity sodium or high-purity magnesium as the reductant.

While a rather elaborate reduction furnace shown diagrammatically in figure 1 must be used, the reduction reaction itself is relatively simple. The reductant and vanadium chloride are charged into a crucible, and the reaction is initiated by heating under an atmosphere of argon. A fairly rapid reaction occurs, with some temperature rise, and is completed within about an hour.

Crucible materials and furnace materials present numerous problems. Few crucible materials are capable of withstanding the attack of liquid magnesium metal at 900° C. Chromium-iron, molybdenum, titanium, and tantalum are the principal choices. Of these, chromium-iron contaminates the metal, and molybdenum and tantalum are prohibitively expensive. Titanium can be used satisfactorily many times, is not excessively costly, and undergoes little attack.

The furnace retort must be constructed of a material that will withstand high vacuum at 900° C without creep or distortion. In practice, type 316 stainless steel was found satisfactory for this operation. Such equipment is quite costly.

High Vacuum Distillation at 900° C

At the close of the reduction reaction, the crucible contains a mass of vanadium sponge metal embedded in sodium or magnesium chloride and excess reductant. These products are separated from the vanadium by treating the crucible and its contents at 900° C under an extremely high vacuum. Under pressures of one tenth of a micron and less at this temperature, the by-product salt and excess reductant are readily volatilized. To attain a vacuum of this order a large oil-diffusion pump is used, backed up by a mechanical vacuum pump. The treatment lasts from 16 to 24 hours depending on the batch size.

At the end of the high-vacuum distillation, the metal is left in a finely divided and very active state and must be protected from atmospheric contamination until it is melted. Melting also is done under inert atmosphere using the consumable electrode, cold mold arc-melting technique developed several years ago to melt zirconium, molybdenum and titanium.

Vanadium compounds, especially the volatile ones, are extremely toxic, and operating personnel must be rigidly protected against ingesting them.

The method described has been conducted on a scale of 10 or 12 lb per batch. While this can be scaled up and has been scaled up to approximately 50 lb in the case of thorium, made similarly, the problems of corrosion, handling and maintenance tend to multiply.

Vanadium metal prepared in the manner described is about as soft as

mild steel, and its principal impurity is dissolved oxygen which is present to the extent of 600 to 900 parts per million. A higher oxygen level than this hardens the metal rapidly.

With certain necessary modifications in technique, a similar procedure may be used to prepare thorium, columbium, tantalum, and several other metals of the reactive group.

"Bomb-Reduction" Method Almost Instantaneous

Again using vanadium as an example, a different approach to the problem of preparing pure ductile metal will be described. This method, involving the direct reduction of a metal compound with an active metal has been used not only for vanadium but also for thorium, molybdenum, uranium, and tungsten. It is commonly called the "bomb-reduction" method and is carried out in a sealed, heavy-walled vessel. It usually yields metal in the form of a fused ingot rather than an active sponge.

Although the reaction mechanism and equipment used are relatively simple, the method severely limits the size batch that can be processed and thus keeps costs high.

Purified vanadium oxide is mixed with high-purity calcium metal, some sulfur or iodine is added to increase the heat of the reaction, and the mixture is loaded into a reactor or "bomb." This is shown diagrammatically in figure 2. The bomb wall is protected by a thin, sprayed coating of sodium silicate and magnesium oxide. The charge is fired electrically by a heated coil of tungsten wire embedded in a mixture of calcium metal and iodine. The reaction is almost instantaneous, and the mass of molten metal falls to the bottom of the reactor where it freezes rapidly and cools in the form of a flat ingot.

Reaction Initiated Under Water

If high-purity metal is to be produced in this reaction there are several conditions that must be observed. The vanadium oxide used must be free of nitrogen compounds, and the same is true for the calcium metal reductant. Experience at Albany has been that calcium metal of sufficient purity to yield consistently high-quality metal cannot be bought. This necessitates purifying the calcium metal by distilling it under extremely high vacuum, after which it must be hogged into small pieces and stored under argon gas until used.

The bomb itself must be immersed in water during the firing to eliminate attack on the bomb wall by molten vanadium, which leads either to contamination of the vanadium or penetration of the wall.

Using this method, ductile vanadium metal has been prepared in 100-lb batches. Bomb reduction is a standard method for preparing uranium and thorium and has been carried out experimentally on both molybdenum and tungsten.

This method is the only one known that yields tungsten in molten form at a temperature above 6150° F.

Experiments are now under way in which useful shapes of tungsten are cast directly in the reduction bomb without any intermediate melting step.

These two procedures are typical of those used in preparing many of the active metals which modern aircraft, rocket, and atomic reactor technologies require for attaining their goals. Although they have been described briefly, they are the result of many years of painstaking and often frustrating work. While the costs of preparing these metals can be expected to drop, as they become available on a larger scale, it is unlikely that they will compete in cost in the near future with the ferrous and base metals on which the economics of mining, milling and smelting are now based.

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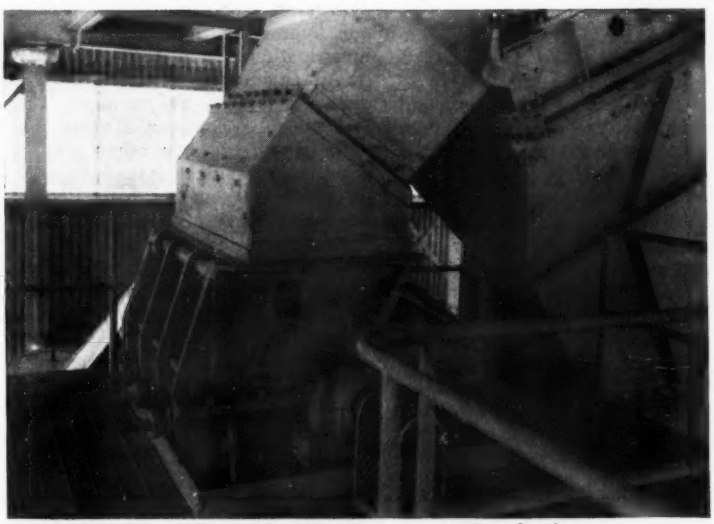
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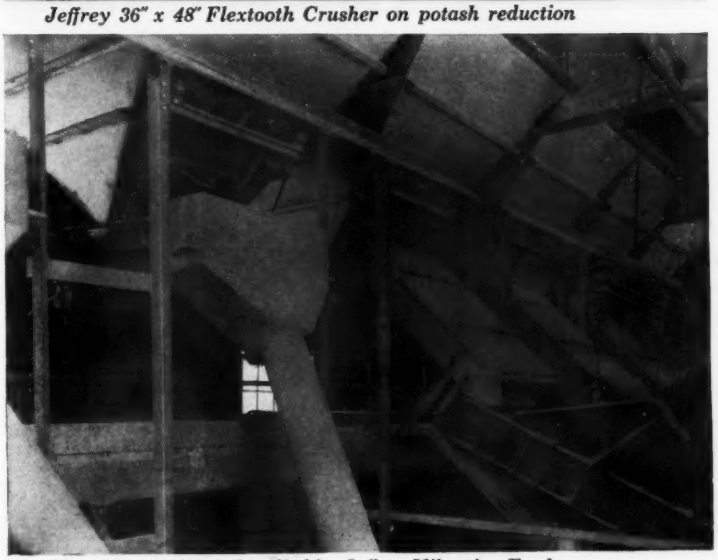
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Viewpoints on Safety

By R. L. WAHL, JR.
Assistant Mine Superintendent
Sunrise Mine
Colorado Fuel and Iron Corp.

Part VI—Accident Prevention

—An Important Aid to Production

SAFETY is defined as the state of being safe, freedom from danger. What we are interested in the production field is to anticipate accidents and prevent them from occurring. We all know we are not entirely free from danger or in a state of being safe, but there are certain precautions that can be taken to insure our safety. To take the necessary precautions is what we try to impart to employes at the Sunrise mine, before they start their shift, in order that they can go their respective ways free from injuries at the end of the shift.

Why is this so important to production? Let us take a case history and follow through the typical procedure for handling an injured employe. Briefly, the circumstances involved an underground employe who had been using a portable electric saw for several shifts. The saw blade was unprotected because the guard was not working properly, but the employe decided he would be careful, and not bother to have the guard cleaned—famous last words. He had been using a 3-in. by 12-in. plank to stop the blade. At the time of the accident, he had no plank to catch the saw and his left thigh took the cut.

Accident Disrupted Normal Routine

Immediately his helper gave him first aid, notified three miners and a hoistman working on the same job, called the cageman, and located a stretcher. The men brought the injured employe to the shaft station. The cager stopped lowering material on the cage, cleared the cage, and came to the level. The injured man was placed on the cage, taken to the surface, to the dry, washed, and checked by the doctor. A supervisor was notified and an employe from the surface maintenance crew was recruited as ambulance driver.

All the time involved from the start of this chain reaction to the time the injured man was placed in the ambulance amounted to only 30 minutes, which, of course, seems relatively insignificant because one man wouldn't tie up the mine. But, actually, five men on the crew lost 30 minutes; the cager, 15; the supervisor, 30; the replacement, 30; and the ambulance driver going 80 miles round trip to the hospital, 180 minutes. Total lost time directly chargeable to the accident—seven hours and 15 minutes.

After an accident of this type, three to six men investigate the whys and wherefores and make recommendations to prevent a recurrence. On this particular case, four men working one hour equal four man-hours on investigation. Then the supervisor, safety engineer, the office, and the doctor report on the accident. This end may be considered small but these employes have other occupations, and accident investigation is an additional item for them. Placing another charge of four man-hours against the accident brings the total thus far to 15 hours and 15 minutes. The ambulance driver had been taken off of his regular occupation. Normally he may never be missed, but in case of an emergency, a replacement for him would be necessary.

The indirect effect is always present. After an accident you can feel it, you know it is there, but a stop



Fig. 1. PROPER DRESS for underground employe — hard hat, safety glasses, gloves, leg bands, and hard toe boots



Fig. 2. WRONG WAY to straighten car coupler. The time it takes for the motorman to stop, pull ahead, and permit the trainman to straighten the coupler is negligible compared to a smashed foot

watch cannot time it. It is that part of human nature which makes us all feel sorry for our fellow employe, regardless of how he may have hurt himself. Every employe on the shift soon knows about what happened and the opposite shift is filled in on all the details.

Production Lost in Every Accident

Each employe in the mine can be figured upon to take at least 10 minutes off production for discussion. Then there is the injured employe's partners and replacement; how good are they the rest of the shift? They go through the actions of working, and even though the body is willing the spirit is weak.

What would 15 minutes to clean the saw have prevented? Direct production time lost equalled 15 hours and 15 minutes. Estimated indirect time of 240 employes at ten minutes each equals 40 hours. At least 55 man-hours chargeable to the accident could have been productive time if the employe had taken ¼-hour to clean the saw. This does not include the loss suffered by employe. All of us have realized this end for years. Fortunately the accident caused no permanent disability, though the employe did miss 26 days of work. This accident occurred near the shaft. If it had happened in the main production area the direct time would have tripled, as additional equipment would have been halted to allow removal of the injured employe.

If the accident wasn't lost time would the charge still be there? All except the ambulance driver's time. Regardless of whether an accident is serious or not, the necessary routine must be followed or else a minor wound may become a major one.

How Minutes Can Save Hours

How does the time required to do a job correctly compare with 50 to 100 production man-hours lost if the employe is injured? Let us consider a few examples. As for wearing the proper clothing, it takes no extra time at all to dress with the proper equipment (figure 1). This gear can protect an employe from both minor and major injuries including cuts, bruises, scratches, fractures, concussions and so on.

Another example is that of a cager working near an open shaft with the gate open—it takes but 30 seconds to put on a safety belt that may save him from serious injury or even loss of his life. A protruding nail is a menace that can be eliminated in a matter of seconds either by removal or clinching over.

The time it takes to bar down the working place, whether it is a minute or two hours, is time well spent if it keeps someone from getting hurt. Similarly, in coupling train cars, the time it takes for the motorman to stop and permit the switchman to straighten the coupler is negligible as compared to lost time resulting from a smashed foot (figure 2).

Ladders should never be used as stairways—it takes but a moment longer to come down a ladder properly and safely with both hands free for use on the steps. Impatience can be another cause of accidents. For instance, there is the employe who jumps off the front of a motor before it comes to a full stop. At the moment, he may save a few seconds but how does this compare with the loss of a limb or life. Still another situation which can cause an injury is where an employe bars out a chute with the bar over the stopper rail rather than under it (figure 3).

These examples illustrate the small amount of time required to do a job correctly to avoid an injury. They are but a few instances where preventive measures, if properly impressed upon the minds of employes, will improve all phases of the operation.

While these examples are not identical to those that occur in other mines, mills, or plants, they are all similar in this respect: for every accident there are lost production hours.

All accidents, regardless of lost time or no lost time, are costly to production, and as labor costs increase the more important accident prevention is to production—the old adage, haste makes waste, still applies to accidents.



Fig. 3. RIGHT WAY to bar out a chute. The bar should be under the stopper rail rather than over it



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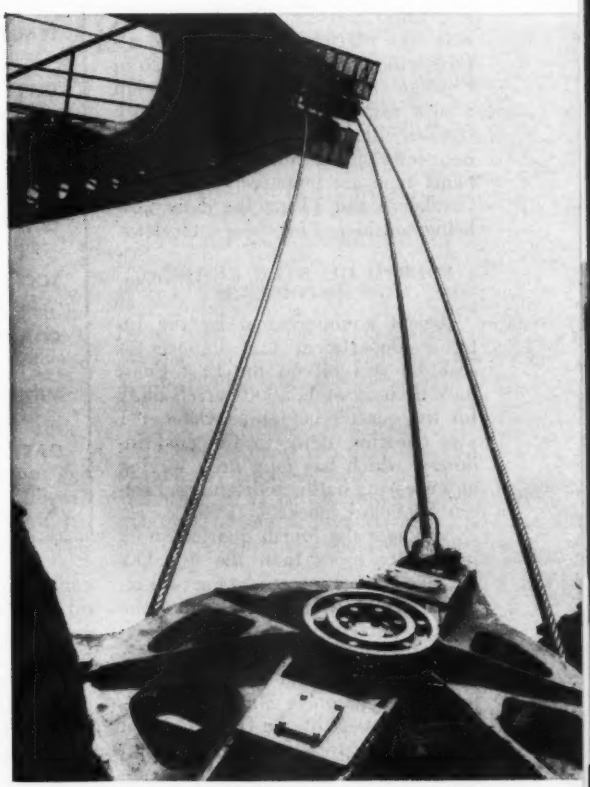
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As Viewed by HENRY I. DWORSHAK of the American Mining Congress

THE 86th Congress adjourned *sine die* September 1 after virtually an all-night session, and most of its members immediately returned to home States and districts to take part in the current general election campaign for the Presidency and for their own reelection.

For the first time in history, the Presidential candidates will engage in face-to-face, hour-long television and radio debates, with all national networks participating. Domestic affairs will be debated September 26 in Chicago; a similar debate on foreign affairs will take place in New York October 21. In addition, two joint hour-long press interviews of the panel type are tentatively scheduled. October 8 and 13 are the dates now being considered for these interviews.

FOURTH QUARTER RESIDUAL OIL IMPORTS SET

Recent announcement by the Interior Department that imports of residual fuel oil on the East Coast have been set at 415,000 barrels daily for the quarter beginning October 1 was cheering news to the coal industry, which has long been waging an unceasing battle to defend its Eastern Seaboard markets.

Although the fourth quarter quota is slightly more than the 400,000-barrel daily limit urged by the coal industry, it is considerably less than the 560,000-barrel level requested by several oil importers. The oil import program was inaugurated by Presidential Proclamation in March 1959 following a report by the Office of Civil and Defense Mobilization that oil imports were threatening to impair national security.

According to L. J. O'Connor, Jr., the Department's Oil Import Administrator, "the maximum import level was established after taking into account all facets of the residual fuel oil situation. In line with established policy, the Department will maintain a continuing review of the residual fuel oil position to insure against the developments of artificial shortages to normal consumers."

Despite contentions of certain importers, O'Connor said, the allocation should be adequate to assure the maintenance of a reasonable level of residual oil stocks during the coming quarter.

Washington Highlights

CONGRESS: Adjourns September 1

RESIDUAL OIL: Fourth quarter imports set

LEAD-ZINC: President vetoes subsidy bill

DEPLETION FOR CEMENT PRODUCERS: Congress acts on cutoff point

ESCAPE CLAUSE: Supreme Court asked to review case

COAL RESEARCH: Funds provided for new office

SOCIAL SECURITY: Medical aid bill is passed

COAL MINE SAFETY: Small mine bill dies in House

MINIMUM WAGE: Conferees fail to compromise

GATT HEARINGS: Witnesses oppose tariff reductions

PRESIDENT VETOES LEAD-ZINC SUBSIDIES

Early this month President Eisenhower vetoed a bill which would have authorized payment of Federal subsidies to small domestic producers of lead and zinc. Asserting that the "problems of our lead and zinc miners have caused me concern for some time," the President said the measure "would harm rather than help the lead-zinc industry."

The legislation contained an annual ceiling of $4.8 million on subsidy payments. This amount, the President declared, "would be completely inadequate to pay the proposed subsidies," and as a result "the bill's intended beneficiaries could be misled into production for which they would not receive the promised subsidies."

Congress did not vote on other legislation which would have placed import taxes on lead and zinc metal, ores and concentrates, and semi-manufactured products, although it was approved by the House Ways and Means Committee and the Senate Finance Committee. These import taxes would have been at higher rates than current tariff duties, and part of the taxes would have been inapplicable as long as lead and zinc prices were at or above specified levels.

DEPLETION CUTOFF POINT FOR CEMENT PRODUCERS

Just before Congress adjourned, it passed legislation which gives to taxpayers producing cement the option of electing to have their percentage depletion allowance for past years computed on the basis of the kiln-feed cutoff point prescribed for future years in the Gore amendment which was passed earlier this year. The Gore amendment is applicable to 1961 and future years, leaving the years prior to 1961 subject to considerable confusion and controversy. H.R. 12536, passed by Congress August 31, is designed to encourage the settlement of litigation by letting those taxpayers who wish to do so have their taxable years prior to 1961 settled on the basis of kiln feed. The law gives the taxpayers 60 days in which to make this decision. The

Mining Congress, on behalf of the cement industry, supported this legislation, which also had the full support of the Treasury Department.

SUPREME COURT REVIEW ASKED IN TARIFF CASE

Attorney General William P. Rogers has announced that the Government will ask the U.S. Supreme Court to review a recent decision of the Court of Customs and Patent Appeals which involves the President's authority, under the Trade Agreements Act, in disposing of escape-clause cases.

The next term of the Supreme Court begins in October. Therefore, whether it will decide to review the case will not be known for some time.

In this case, an importer of bicycles protested the increased rate of duty assessed under a Presidential Proclamation issued pursuant to an escape-clause proceeding. The proclaimed rate was lower than the rate recommended by the Tariff Commission, and the importer contended that the President was not authorized to adopt only partially the Commission's recommendations.

The appellate court affirmed a Customs Court finding that the President, under the escape clause of the 1951 Trade Agreements Extension Act, had no authority to proclaim a rate of duty different from that recommended by the Tariff Commission, although he could have accepted or disregarded Commission recommendations in their entirety.

Presidential action in other escape-clause cases, including imposition in 1958 of import quotas on lead and zinc, may be affected.

FUNDS PROVIDED FOR COAL RESEARCH OFFICE

In the last appropriations bill of the session, Congress provided $1 million to set up the recently authorized Office of Coal Research in the Department of the Interior. This amount had been approved earlier by the Budget Bureau.

In supporting the request for funds at a House Appropriations Committee meeting, Assistant Interior Secretary Royce Hardy stated that the money "will be used initially to organize the Office of Coal Research and for supervising and monitoring the contract research that is contemplated." He added that plans call for early establishment of industry advisory committees to assist the Secretary of the Interior in the selection of research projects.

"There are many coal research proposals to be considered and evaluated," Hardy said. "Those selected should show immediate promise of development of new and more effective uses for coal, expanding present uses, reducing the cost of coal production and distribution, and providing the most immediate economic assistance to the industry."

The new agency's work will be of a short-range nature, he testified, and will supplement the longer range projects of the Bureau of Mines.

SOCIAL SECURITY, MEDICAL AID BILL IS APPROVED

One of the final acts of the 86th Congress was to approve a compromise measure making a number of changes affecting the Social Security system and authorizing a separately financed program for medical care of the aged. The President is expected to sign the bill.

The medical care program calls for joint financing by the Federal Government and participating States, with the Federal share of from 50 to 80 percent coming from general revenues, as recommended by the Administration, and not from Social Security funds.

Changes in the Social Security law include removal of the age 50 requirement for disability benefits and modified benefits reduction when retirees earn more than $1,200 a year.

The measure would also raise the Federal unemployment tax rate from 0.3 percent to 0.4 percent and tighten provisions with respect to repayment of advances to States having depleted unemployment compensation reserve accounts.

COAL MINE SAFETY ACT FAILS TO PASS

House action on a Senate-passed bill which would extend the Bureau of Mines' mandatory safety enforcement powers, under the Federal Coal Mine Safety Act, to now-exempt coal mines normally employing no more than 14 persons was blocked when its sponsors failed, near the end of the session, to get unanimous consent for its consideration.

Marling J. Ankeny, Bureau director, had testified in June at House Labor subcommittee hearings that his agency favored enactment, and the Committee's report noted that "experience has shown that there is no logical reason for applying the mine safety provisions set forth in the 1952 Act to mines employing 15 or more persons and not applying these safety provisions to mines employing 14 or less."

Supporters of the bill indicated it would be again introduced next year.

MINIMUM WAGE BILL DIES IN CONFERENCE COMMITTEE

Legislation to raise the minimum wage and extend coverage of the Fair Labor Standards Act failed to win the approval of Congress when, in the closing days of the session, Senate and House conferees could not agree on a compromise bill.

The Senate had passed a measure providing for a three-annual-step program to raise the minimum wage to $1.25 an hour and extend wage and overtime coverage to some 4 million additional workers, mostly in retail and service businesses. The House had previously passed a more limited bill raising the minimum wage to $1.15 and extending coverage to about 1.4 million more workers.

House conferees, led by Rep. Graham Barden (Dem., N.C.), stood fast for the House version, which the Senate conferees, headed by Sen. John Kennedy (Dem., Mass.), thought to be inadequate. Kennedy said the Senate conferees were faced with "taking the House bill or nothing. We feel the House bill would not be progress."

Similar legislation may be high on the agenda of the 87th Congress.

PERIL-POINT HEARINGS ON METAL PRODUCTS HELD

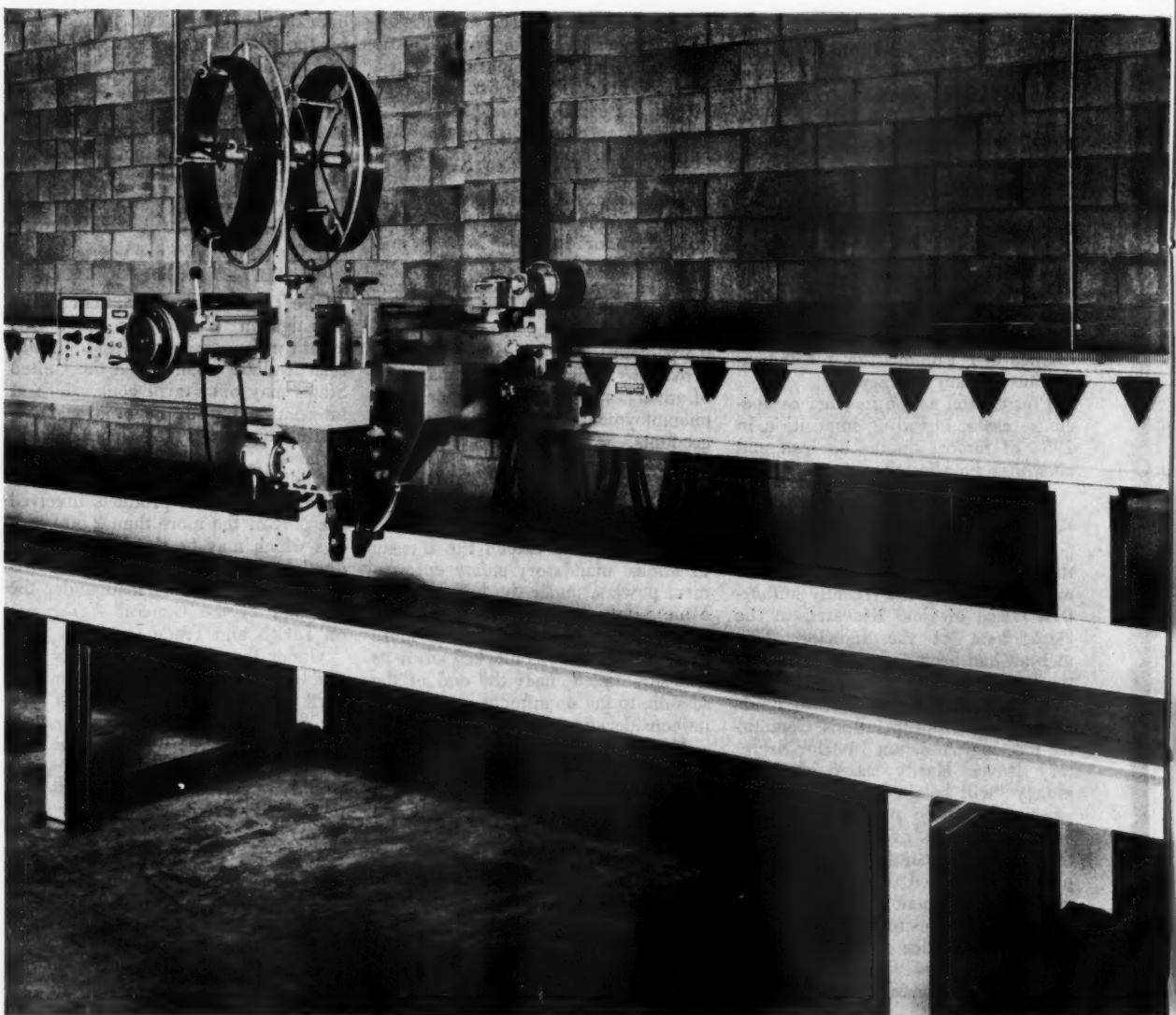
The Tariff Commission held public hearings in Washington early this month with respect to metal and mineral products upon which the United States may offer tariff concessions at international trade negotiations now getting under way at Geneva, Switzerland.

Chiefly fabricated articles, the metal and mineral products involved are part of the more than 2,500 articles which may be the subject of reductions negotiated during the 37-nation meeting being held under the auspices of the General Agreement on Tariffs and Trade (GATT).

Under the Trade Agreements Act, the Commission must determine the peril point with respect to each article being considered for a possible concession. The peril point is the lowest level of duty at which imports would not seriously injure the domestic industry producing a like or similar article.

Witnesses at the hearings, which are a part of Commission procedure in setting peril points, generally protested any lowering of tariff barriers on the articles involved and in some cases asked for higher duties on imports.

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personals

Robert Tilbot has become president of Eastern Gas & Fuel Associates succeeding the late Eugene H. Bird. Since 1955, Tilbot had been executive vice president. Other officers elected to new positions include **James W. Tyson,** from vice president to senior vice president and member of the executive committee; **William B. Ross,** vice president and general manager of the coal division; **Allan C. Johnson,** vice president and executive assistant to the general manager of the coal division; and **John N. Phillips,** from assistant to the executive vice president to vice president.

The **New Jersey Zinc Co.** has announced the election of **James R. Alexander** as vice president in charge of sales succeeding **Robbert G. Kenly,** who will assume new administrative duties. Formerly vice president-sales, since 1958, of **H. K. Porter Co., Inc., Thermoid Division,** Trenton, N. J., Alexander has had over twenty years' experience in sales work.



J. R. Alexander

Charles E. Schwab has been appointed president and chief executive officer of the Bunker Hill Co. He fills the position left vacant by the death of John D. Bradley last November.



Schwab has served as the company's general manager of Kellogg, Idaho, operations since the first of this year, and was named a vice president April 1. He will continue to make his headquarters in Kellogg.

Schwab started work with Bunker Hill as a mining engineer in 1944. In 1948 his position was expanded to include industrial relations work, as well as his supervisory duties at the Bunker Hill mine, the nation's largest lead mine. He was made manager of the Employe and Public Relations Division in 1955, and in 1957 was appointed to the newly created post of assistant to the president.

Charles H. Moore, nationally known expert in research organization, physical chemistry, and metal and metalloid product development has been appointed technical director of the Copper Products Development Association. He had formerly been executive director of corporate research and development and manager of Semiconductor Operations for P. K. Mallory & Co., Inc.



William J. Rude has been appointed assistant to the president of Glen Alden Coal Corp. Rude comes to Glen Alden after a year and one-half as resident manager of Bislig Industries in the Philippine Islands. Earlier, he had been vice president of American Gas & Electric Service Corp. coal companies and served with that company for 11 years in various engineering and managerial positions. Other experience includes six years in engineering with Pittsburgh Coal Co. and six years as an engineer and mine superintendent with the Phosphate Mining Co.



James W. Kinnear, Jr., executive vice president of Tennessee Coal & Iron Division, U. S. Steel Corp., has become vice president-steel producing divisions. He has been succeeded by **Oscar Pearson,** who had been administrative vice president of steel producing divisions.

1961 AMC Coal Show



E. S. Elfred, chairman of the board, Peabody Coal Co., St. Louis, Missouri, has been named chairman of the Program Committee for the 1961 Coal Show of the American Mining Congress to be held in Cleveland, May 15-18.

Elfred will head a nation-wide committee of coal mine operators and equipment manufacturers in the important task of selecting subjects and speakers for the Convention, which will draw many thousands of coal mining men from all parts of the United States and abroad. The committee has the responsibility for developing a convention program that will act as a spur to progress in coal mining technology, and will bring the industry abreast of the latest advances in methods and equipment for mining and processing coal.

Anyone wishing to suggest a topic for discussion at the 1961 Coal Show should write the American Mining Congress, Ring Building, Washington 6, D. C. The Program Committee will meet in mid-November to consider all of the suggestions received and draw up a convention program.

Highlight of the 1961 Coal Show will be an immense display of mining equipment. Machines for use in all phases of underground and strip mining, as well as in preparation plants, maintenance shops and power systems will be exhibited in Cleveland's Public Auditorium and on the Mall immediately adjoining.

Herbert G. Sobelton has been appointed vice president-administration of Hercules Cement Co., a division of American Cement Corp. Sobelton has been active in various capacities throughout the company during the past nine years, and prior to being advanced, he was manager-administration services.



Judson H. Whitman has been promoted to assistant director, Rare Earths and Thorium Division, Michigan Chemical Corp. He will be in charge of special projects related to the company's rare earth program and will continue to handle the division's raw materials, mining and exploration activities.

Gordon Swetnam, former general foreman at the Holden No. 22 mine of Island Creek Coal Co., has accepted a position with the West Virginia Mines Department. He will be connected with the department's roof control program and will be available for special assignment work in the prevention of mine fires and explosions.

Arthur B. Homer, president since 1945 and chief executive officer of Bethlehem Steel Corp., has become chairman of the company's board of directors. He succeeds the honorary chairman, the late Eugene C. Grace, who had retired as chairman in 1957. For the past three years Homer has served as chief executive officer and will continue in that post. The former vice president in charge of steel operations, **Edmund F. Martin,** has succeeded Homer as president.

John H. Torreano has succeeded **Edwin H. Anderson** as superintendent of the Tobin Ore mine of Republic Steel Corp. at Crystal Falls, Mich. Anderson has retired after 40 years with Republic and its predecessor company.

Harry M. Tibbs, formerly assistant to the president of Truax-Traer Coal Co. has been named vice president in charge of operations. Before joining the company in 1953 as manager of the West Virginia Division, he was director of employment and industrial relations of Union Pacific Coal Co. in Montana. He became assistant to the president of Truax-Traer in 1959.



L. J. Parkinson, head of the department and professor of mining engineering at Colorado School of Mines has been named to the board of directors of Truax-Traer Coal Co.

Frank W. Wyatt has been promoted to plant superintendent at the Globe Mining Co. uranium mill in the Gas Hills, Wyo.

OBITUARIES

Eugene Gifford Grace, 83, former president and honorary chairman of the board of Bethlehem Steel

During his career, Mr. Grace became one of the highest paid corporate officers in the history of the United States. He joined the industry with Bethlehem Steel in 1899 as a crane operator earning $1.80 per day. By 1902 he had advanced to superintendent of yards and transportation, and in 1906 he went to Cuba as general superintendent of a subsidiary, Juragua Iron Co. In 1911 he became vice president of Bethlehem Steel Co. and two years later he was elected president. In 1916 he became president of Bethlehem Steel Corp., which position he held until he became board chairman in 1945.

Hans A. Vogelstein, 56, former president of American Metal Climax, Inc., died August 6 in New York City following a long illness that had brought about his resignation from the company last year.

An authority in world gold and silver matters, Mr. Vogelstein joined American Metal Co. at age 19. In 1957 he was named president of the company and later that year became president of American Metal Climax when Climax Molybdenum Co. merged with American Metal Co.

Brent Hart, 71, former prominent mine operator in the western Kentucky coal fields died in Ft. Lauderdale, Fla., July 13.

Mr. Hart's career in the industry began at age 19 when he was owner-operator of the Hart Mining Co. After selling his interests in this company in 1912, he purchased the Terry Coal Co. He then organized the West Jellico Coal Co. and later formed Hart Coal Co. to operate on coal land holdings near Morton's Gap, Ky.

B. B. Housman, secretary of the Smokeless Operators Association, died in Bluefield, W. Va., July 30. He was recovering from an operation, and returned to work briefly, when he became the victim of heart failure.

The 43 years of his working life were spent in the employ of the Pocahontas Operators Association, which merged in 1959 with the Winding Gulf Operators Association to become Smokeless Operators Association. Housman served first as statistician, then assistant secretary, and finally, secretary. Mr. Housman was the first director of the Southern Appalachian Industrial Exhibit, more familiarly known as the Bluefield Coal Show.

Eugene H. Bird, 67, president of Eastern Gas & Fuel Associates, died in Boston, July 19.

Mr. Bird served as a chemist for the Atlantic City Gas Co. and the Bethlehem Steel Co. before joining Koppers Co. in 1917 as a research chemist. When Eastern Gas & Fuel was formed in 1929 he was elected a trustee and named assistant to the president. He became executive vice president in 1949 and president in 1955.

Horace Moses, 80, retired general manager of the Chino Mines Division of Kennecott Copper Corp., died in Santa Fe, N. M., on June 20.

Mr. Moses went to work for the old Santa Rita Mining Co. as a miner in 1900 and became foreman of a 100-tpd mill there before leaving in 1903. For the next six years he worked throughout the western United States and Mexico. In 1909 Mr. Moses joined the Chino Copper Co. and became mine superintendent before being transferred to its subsidiary, Gallup American Coal Co., as general superintendent in 1917. He was general manager of Gallup American in 1938 when he was recalled to become general manager of the Chino operations. He retired in 1947.

NEWS and views

Eastern

Copper Range to Develop New Copper Deposits

Copper Range Company's board of directors has authorized the sinking of a shaft in a new ore body in the Upper Peninsular of Michigan. The ore body, some 2000 ft beneath the surface and about two miles southwest of the White Pine mine, is on property owned by Copper Range.

Upon completion of the shaft, scheduled for the fall of 1961, additional mining and metallurgical testing will be done. If these tests show the ore and mining conditions to be similar to those of White Pine, a mining unit will be established. Mill and smelter facilities at White Pine mine, owned by a subsidiary company of Copper Range, would be used to process the ore from the new mine.

Flintkote To Acquire Newfoundland Gypsum Deposits

The Flintkote Co. has reached a basis of understanding with the Province of Newfoundland providing for acquisition of huge gypsum reserves on that eastern Canadian island. Under terms of the understanding, Flintkote would have immediate access to some 40 sq miles of Newfoundland's gypsum producing properties at Flat Bay and subsequently to an area comprising nearly 3000 sq miles from which it intends to supply gypsum and gypsum products to the domestic U. S. market as well as parts of Canada. These properties, on which the company would be granted a 99-year lease, renewable for an additional 99 years, have an indicated gypsum reserve of at least 200,000,000 tons based upon core drilling by Newfoundland's Provincial Bureau of Mines, test drilling by Flintkote's own geologists and additional geological surveys conducted by both.

As part of its understanding with the Province of Newfoundland, Flintkote will acquire certain of the assets of the Atlantic Gypsum Co., Ltd. at Corner Brook, Newfoundland, for $1,000,000 in cash. Among these assets are the material and equipment to build a six-mile long aerial conveyor from the existing gypsum quarries at Flat Bay to a deep water shipping point near St. Georges, together with a pier and shipping facilities. Atlantic Gypsum has a small gypsum producing plant in Newfoundland which would be managed by Flintkote. Options would also give Flintkote the right to purchase this plant outright.

The understanding provides for Flintkote to pay the government of Newfoundland five cents for every long ton of gypsum rock produced.

Washing Process Developed for Alabama Iron Ore

A simple washing process recently developed by the U. S. Bureau of Mines for treating certain ores from Alabama iron deposits has proved commercially feasible and now is being used to provide a high-quality concentrate for blast furnaces.

Known locally as "Dudley red-iron ore," the deposits are near Dudley and Vance, Ala. Their usefulness appeared uncertain because of clay-like materials mixed or "interbedded" with the iron. Working cooperatively with the U. S. Pipe & Foundry Co., and the University of Alabama, both at Tuscaloosa, the Bureau developed

(Continued on next page)

U. S. Group to Assist India in Program to Expand Coal Production

In response to a request from the government of India,, the U. S. Department of State has announced that a three-man team of top U. S. coal mining executives will be sent to India to advise that country in developing a program for expansion of its production of coal.

The team, which is going to India under the auspices of the International Cooperation Administration, is comprised of Herbert E. Jones, Jr., president, Amherst Coal Co.; Edwin R. Phelps, president, Pittsburg & Midway Coal Mining Co.; and Raymond E. Salvati, president, Island Creek Coal Co.

Salvati, who is also president of the American Mining Congress, will serve as team leader. B. C. Saunders of Island Creek will accompany the team as its executive assistant. The group is expected to depart from New York for New Delhi on August 6.

India, under its third five-year plan, is committed to doubling its present annual output of coal which is now approximately 50,000,000 long tons. The U. S. group will survey plans for the expanding coal mining program and, upon its return to the United States, will submit a report of its finding and recommendations.



Shown as they prepared to leave New York for India are (left to right) B. C. Sanders, assistant to Raymond E. Salvati; Mrs. Salvati; R. E. Salvati, president of Island Creek Coal Co.; Herbert E. Jones, Jr., president of Amherst Coal Co.; Mrs. E. R. Phelps and E. R. Phelps, president of Pittsburg & Midway Coal Mining Co.

(*Continued from previous page*)
and tested a washing and desliming cycle to upgrade the ore. At this point, Southeastern Coal & Iron Co. was convinced of the commercial possibilities and began its own research with the method. This culminated in construction of a 25 tph pilot plant, since enlarged. Other informal cooperators in the research included Republic Steel Corp. and Woodward Iron Co.

A copy of Report of Investigations 5623, "Concentrating Argillaceous Surface Iron Ore of Tuscaloosa County, Ala., by Washing," by I. L. Feld and W. E. Lamont, of the Bureau and R. E. Perry of U. S. Pipe & Foundry, can be obtained from the Publication-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

Operations Research Seminar Held in Michigan

Several companies from the Great Lakes area participated in an Operations Research Seminar July 20–21 at the Michigan College of Mining and Technology. Its purpose was to investigate the question: "Do the techniques of Operations Research have an application to the Lake Superior district mining operations?" Papers defined the term *Operations Research* and described its limits, its power, and its philosophy. Some examples of techniques and applications were demonstrated in such areas as linear programming, queuing or waiting-line theory as applied to operating systems design, investment or equipment replacement analysis, statistical analysis as applied to sample data for purposes of ore estimation, and case histories of mining applications.

The program was aimed primarily at operators who may have some discretion in acceptance or rejection of the Operations Research approach to management problems. Emphasis was on recognition and analysis of problems, and the usefulness of mathematical models.

What to Do With Depleted Uranium?

Potential uses of depleted uranium, particularly in the mine and steel industry, are suggested by Battelle Memorial Institute metallurgists Vincent Barth and George Rengstorff in the July issue of *Battelle Technical Review*. These uses may provide the solution to the problem of what to do with the huge stock of depleted uranium currently accumulating at a rate of tens of millions of pounds a year.

According to the authors, depleted uranium shows promise as an alloying element for tool steels, as a scavenger for impurities in steels and other metals, as a spheroidizing agent in making nodular iron, and as an agent for strengthening metals by dispersion hardening. It could also be used as a gamma-ray shielding material and as a constituent of bearing metals, high density alloys, and alloys of various metals.

The Battelle metallurgists emphasize that much research is still needed to supply all the data required to use uranium effectively in steel.

Bureau Plans Extensive Copper Research Program

The U. S. Bureau of Mines has planned a vigorous research program on copper for fiscal year 1961, which include promising projects designed to improve mining and metallurgical methods.

Research is continuing on the mechanics of block-caving, the structural factors affecting the stability of open-pit slopes, and the behavior of flat-lying roof strata in room-and-

(*Continued on page 116*)

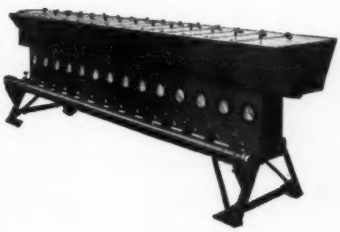


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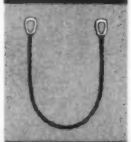
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MACWHYTE Wire Rope COMPANY

(Continued from page 113)

pillar mining. The Bureau indicated that recently developed techniques in use of stress-and-strain measuring and recording equipment will provide information for determining rock pressures and for interpreting ground movement so data can be provided for designing safe and economical practices. Another investigation will involve the optimum truck-shovel size combination in open-pit mining.

Copper and other base-metals deposits in Prince of Wales Island, Prince William Sound region, and other significant areas in central Alaska will be examined. Open-pit block-caving mining methods in Arizona will be studied and information on procedures, equipment, costs, and other pertinent phases of the operations will be compiled for publication. A study will be made of the methods, procedures, and cost of sinking a new five-compartment shaft in Arizona. The Bureau will up-date information on copper, lead and zinc reserves in Arizona, Colorado, New Mexico and Utah.

Emphasis will be placed on metallurgical research on copper smelters slags, and production of iron-copper alloys from these slags will be investigated. Additional investigations will be conducted on the physical and chemical properties and reactions of a reverberatory slag.

Studies of hydrometallurgical and pyrometallurgical processes will seek improved recovery of copper from ores of Arizona and Michigan. Flotation techniques will be investigated to develop increases in copper recovery and grade of concentrate. Research on the segregation process will be extended to determine the feasibility of segregating copper from its ores in a fluidized-bed reactor, and appraisals will be made of methods to recover the segregated copper, such as screening, flotation and agglomerate tabling.

U.S.S.R. Announces Coal Mine Safety Device

A Russian scientist, Mikhail Antsyferov, has designed an apparatus which makes it possible, according to Russian claims, to forecast at least six hours in advance any sudden eruption of methane.

Essentially a "geophone," the device is able to detect the radiation of microsonic waves which build up in the coal seam before such eruptions occur, the Russians say. The geophones—there are only two of them so far—have been tested for some years in mines of the Donbas coal basin.

Another development of interest to American coal miners is the development of a methane monitoring system to prevent mine explosions. Methane measuring stations in various parts of a mine feed information through the mine telephone network to a computer which programs the ventilation system—as methane builds up in an area more air is automatically directed into the area, thereby diluting the methane. If the methane builds up to a dangerous concentration, the mine power system is automatically cut off.

Galvanized Mine Rails Last Longer

By hot dip galvanizing rails which are used to carry heavy ore loads, a number of Dutch coal-mine operators are now getting three times the service life previously experienced with uncoated steel rails, according to John L. Kimberley, executive vice president of American Zinc Institute. Information from a Dutch galvanizing trade association shows that conventional steel rails formerly used in

(Continued on page 120)



Model R3W-20 Floor Type
Handles x-type bits up to 5"—cross type up to 5½"

LENGTHEN BIT-LIFE, LOWER DRILLING COSTS

With Detachable Rock Bit Grinder . . .

You'll save time, labor and upkeep when you recondition your carbide-tipped rock bits on a Blount grinder. It's precision machine sharpening, far more accurate and five times faster than it could be done by the most skilled operator. You're sure of uniform, symmetrical grinding with the exact angles the manufacturer intended. Depend on Blount for

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Central Electric do Furnas
Vulcan Materials Co. — Stockbridge Stone Co.

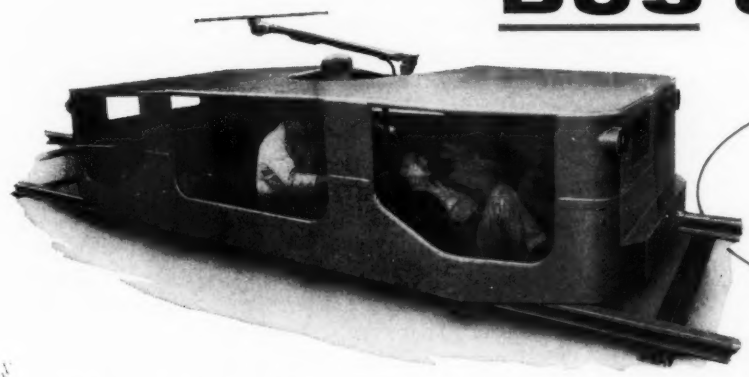
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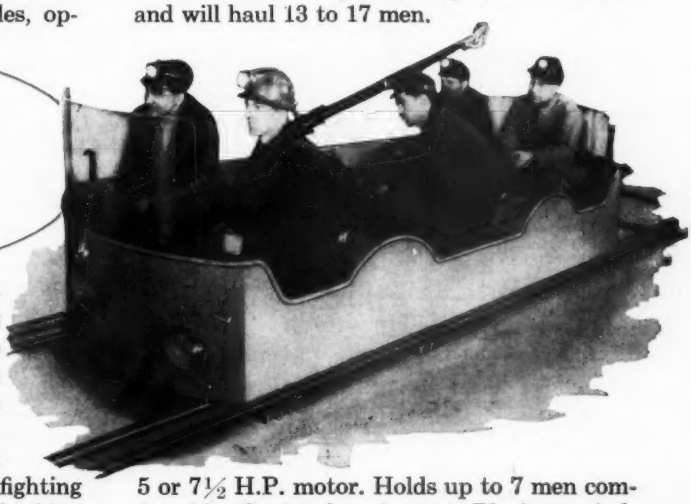
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MINE PORTAL BUS

■ There's no wasted motion with this self-propelled Portal Bus because it is fast on the take-off, saving manpower time for conversion into more tonnage. And it is designed for safety, with hydraulic operated running brakes plus mechanical emergency and parking brakes direct on the wheels. For severe grades, optional electric dynamic system produces braking effect from the motor for *extra* safety under all conditions. Also the split roof construction gives operator unimpeded, all directional view, while the trolley pole is always within quick reach. This bus is powered by 15 H.P. motor and will haul 13 to 17 men.

Lee-Norse
MINE JITNEY



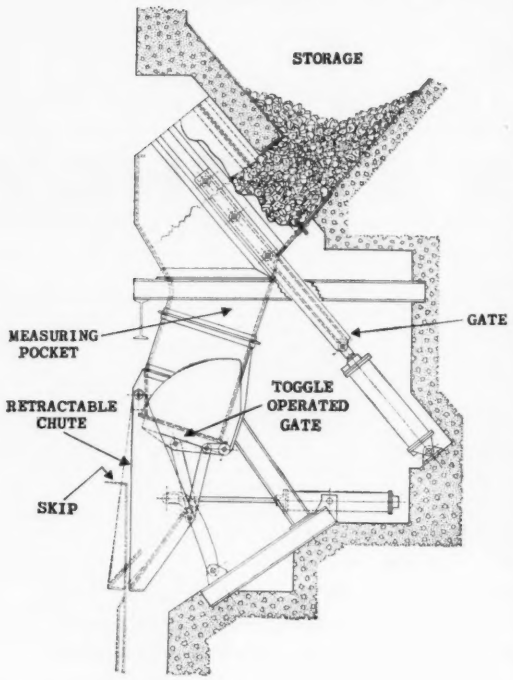
■ The Mine Jitney is the "Jack-of-all-Trades" of the mine fleet because its versatility enables it to be used on the regular job and for emergency. It can handle the job of furnishing fast, safe transportation of key personnel, maintenance crews and special groups; and can double up as an ambulance or fire-fighting equipment car. Designed with twin braking systems for added safety. Powered with either 5 or 7½ H.P. motor. Holds up to 7 men comfortably. Optional equipment: Plexiglas windshield, fire extinguisher, stretcher equipment.

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SPECIALISTS IN COAL MINING EQUIPMENT

Automatic Skip Loaders

(A working model will be on display at the Mining Congress Show — Booth 534)

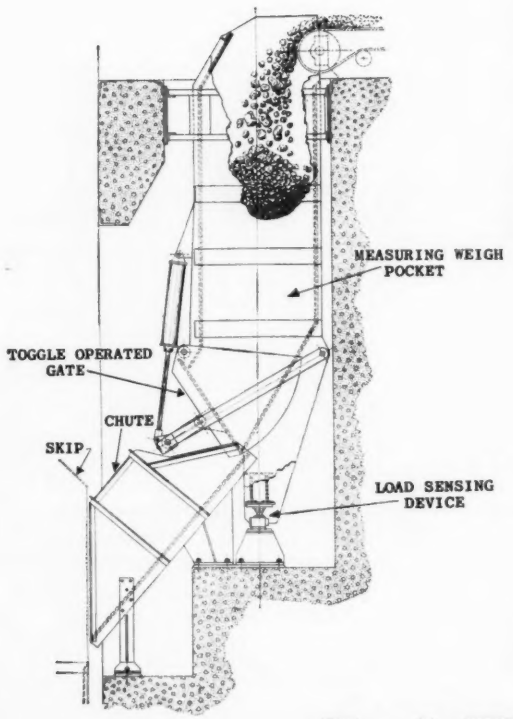


NOW USED FOR HARD ROCK MINING IN MULTILEVEL OPERATIONS

MEASURED BY VOLUME SKIP LOADER

Upper cut-off gate is open, material from a storage bin above flows into the measuring pocket of skip loader. After a set time, the undercut type gate pushes up through the material. Any larger chunks above the gate will not impede the action of the gate . . . they will be floated to the top of the material flow line, which is governed by the angle of repose of the material.

The discharge gate between the measuring pocket and the skip is toggle operated for better flow and tight sealing when closed. Also, it conserves air required to operate the toggle gate. The weight of ore to be discharged actually aids in the opening of the gate once the linkage is past the center. Therefore, smaller cylinders can be utilized. Flow control with cam operated valves can be included so that gate action is smooth and operating impacts are virtually eliminated.



MEASUREMENT BY WEIGHT SKIP LOADER

This loader does not require the cutting off of load after material flow from the upper bins to the measuring pocket has stopped. A load sensing device causes the gate to close when the desired weight of load has been discharged into the measuring pocket.

This type of loader can be used in conjunction with other types of pocket feeding . . . conveyors, pan feeders, drum feeders or reciprocating plate feeders. When used with one of these feeders, the signal from the load sensing device shuts off a feeding mechanism when the measuring pocket has received the desired weight of material.

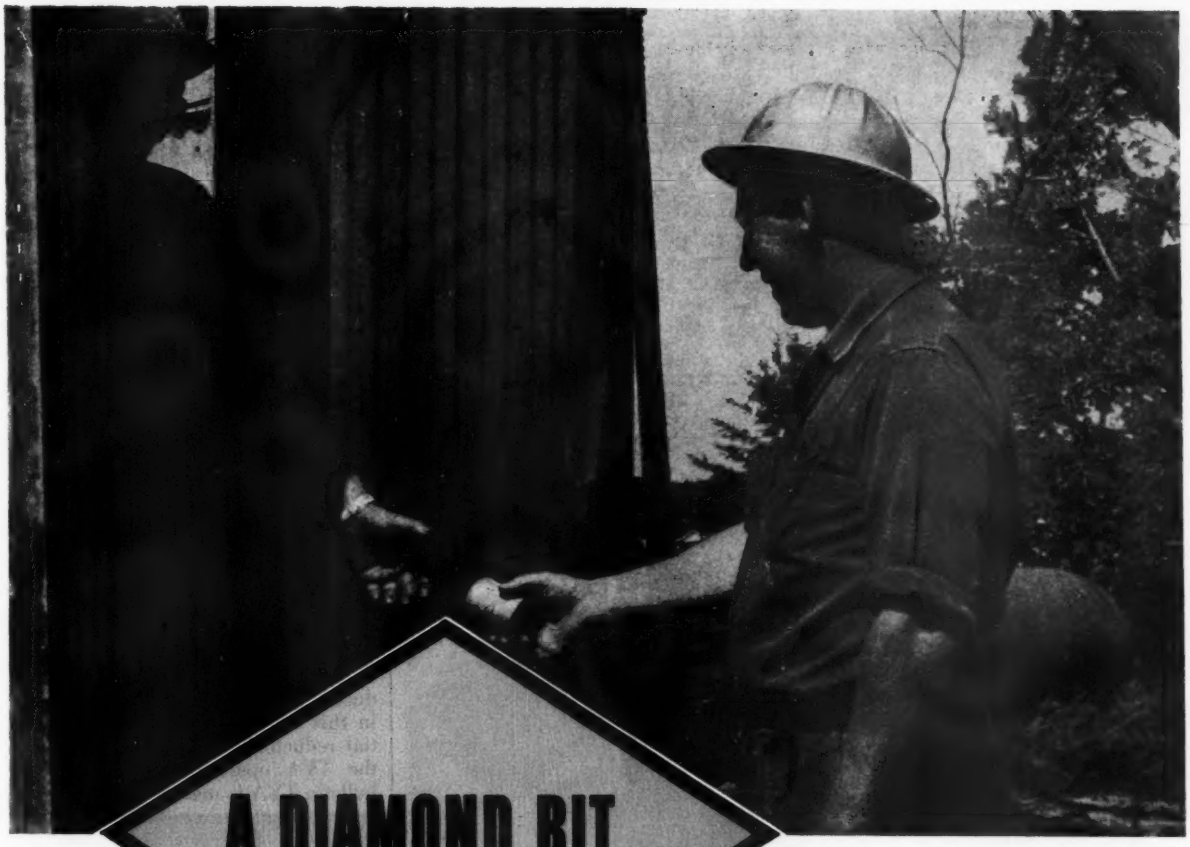
The automatic controls of both loading systems described above can be tied in with automatic hoist control to provide for a completely automated material hoisting system. In multilevel operation the complete system is actuated by one push button at the operating level. No other level can take over command of the skips without their being released at the level from which they have been operating. During operation from a given level, the loaders at other levels are rendered inoperative through interlevel interlocking control.

Lake Shore manufactures other loaders than those shown and can match the proper automatic loaders to your specific conditions.

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Whatever your drilling needs—underground or on the surface, exploration or blast holes, shallow or deep drilling with air, water or mud—you'll find that Christensen Diamond Bits are your assurance of drilling at "less cost per foot."

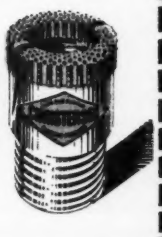
Christensen Diamond Bits cut straighter holes, last longer and cut even the hardest rock economically.

And, regardless of your job location or scope of operations, there's an experienced Christensen field consultant available to recommend the right "custom designed" bit for your job. This means that you can be confident that the diamond size and pattern, waterways, matrix hardness and bit style correctly meet your drilling conditions.

"Less cost per foot."

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To obtain faster penetration, straighter holes, better diamond usage, unequalled service and experienced consultation, contact Christensen.

(Continued from page 116)

the Dutch mines became corroded and unsafe after two to three years as a result of the constant exposure to water, humidity, and aggressive chemical attack—water in coal mines is frequently high in sulphur content. Since applying a protective zinc coating by hot dip galvanizing, the miners have discovered that the rails can now be relied on for from five to six years of efficient and safe, heavy-duty service.

Joy Acquires Compton, Inc.

Joy Manufacturing Co. is entering the business of manufacturing earth and coal augers through the purchase of Compton, Inc., Clarksburg, W. Va. C. E. Compton will be president of Compton, Inc., which will be operated as a wholly-owned subsidiary of Joy. Joy has also entered into an arrangement with C. E. Compton under which Joy and Compton will jointly undertake the development of a new system for the continuous mining of coal in seams of less than 36 in. height.

ALSO . . .

Tennessee Valley Authority recently announced the publication of ***Chemical Engineering Bulletin No. 4,*** one of a series of bulletins presenting results of its studies in fertilizer production technology. The latest bulletin presents the results of studies on various reducing carbons for electric phosphorus furnace operation. As a result of this work, TVA has adopted the use of bituminous coal to supply approximately half its requirement for phosphorus furnace reducing carbon. Until recently TVA used coke to supply all of its reducing carbon requirements, but investigation showed that under certain conditions the carbon in bituminous coal could be made to react with phosphates to produce phosphorus of suitable quality for use in fertilizer production. The use of bituminous coal in this manner results in a substantial reduction of production costs in the TVA operations. Through this bulletin TVA is making the results of its investigations available to private industry.

Reserve Mining Co. plans to spend $120,000,000 on its pending expansion program of taconite mining at Babbitt, Minn., on the Mesabi Iron Range, and the concentrating, agglomerating and other facilities at Silver Bay on Lake Superior. Also included in the program is the double tracking of Reserve's own railroad connecting Babbitt and Silver Bay.

The Eighth Annual Engineering Management Conference will be held at the Morrison Hotel in Chicago, Ill., on September 15–16. Subject of the meeting will be "Managing Tomorrow." The conference will cover Impinging Forces, New Requirements and New Aids for Managers, Impact on Professional People, and Impact on Education. The conference is sponsored by seven major professional engineering societies: American Institute of Electrical Engineers; American Institute of Mining, Metallurgical and Petroleum Engineers; American Society of Civil Engineers; American Society of Mechanical Engineers; American Institute of Industrial Engineers; Institute of Radio Engineers, and American Institute of Chemical Engineers.

(More News on page 122)



Long-hole drilling made easier—

more profitable with

ROPE thread BRUNNER & LAY tools

If it's deeper holes you are after, you can't buy more productive tools than the rope-thread Brunner & Lay assembly . . . carbide Rok-Bits, Couplings, Carbo-Rok Sectional Rods, Striking Bars—everything from chuck to muck.

Solid rope thread connections ensure greater rod rigidity for deeper drilling. Easy hand uncoupling. An unbeatable drilling unit designed and made to work together. Request complete catalog #759 from your local Brunner & Lay dealer, or our nearest plant.

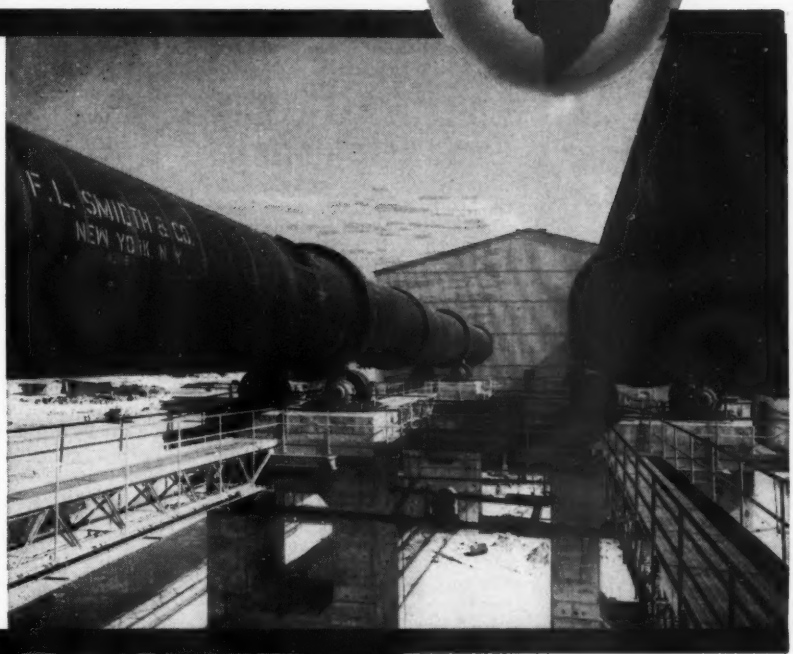
Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. *Est. 1882.* Plants & conversion shops: Albuquerque, Asheville, Birmingham, Dallas, Long Island City, Los Angeles, Philadelphia, Sacramento, Seattle, Yardley (Spokane), Lachine, Que.
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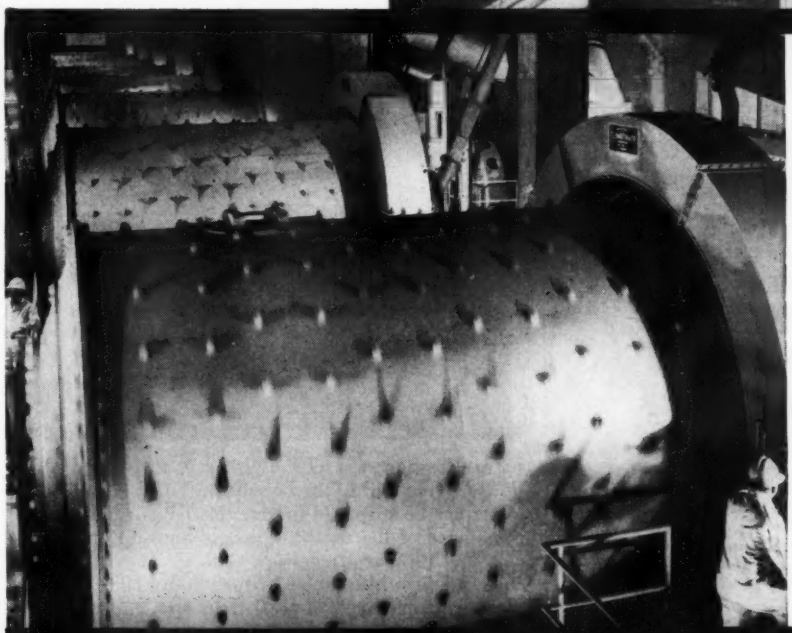
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For sintering, nodulizing, calcining, desulphurizing, oxidizing and reducing roasting. Coolers, precoolers, preheaters, recuperators. Auxiliary equipment for Rotary Kiln Plants.





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Get DOUBLE EXPANSION for DEPENDABLE roof support with PATTIN roof bolts and expansion shells



STYLE D-1

The unique double expansion feature of all Pattin expansion shells insures *dependable* roof support, in hard or soft roof conditions. Their double holding power guards against failure — even under a 20 ton pull!

Pattin features include a parallel contact with the hole, and no definite drilling depth is required, as the shell can be securely anchored at any place in the hole. They anchor solidly and will not turn while being tightened. Wedge and shell are assembled in a manner to prevent loss of parts in handling, and the bolt and shell assembly are furnished as a complete unit. Plates are bundled separately. No special nuts or ears are required on the bolts. These features make a safer roof — and a safer roof means fewer accidents, increased production, more clearance for equipment operation and better ventilation.

Pattin specializes in roof bolting —it's our business, not just a sideline! Your business is important to us, and our service engineers are always available for consultation on your roof problems—ready to give you service when you need it! WRITE OR PHONE US TODAY for complete details.

Reg., U.S. and foreign Pat. Offices



The PATTIN split-type BOLT



The split-type bolt is one of the first slotted bolts, and continues to be a favorite wherever split-type bolts are used. Many mines still prefer this type. The bolt is a full 1-inch in diameter, with cut threads and furnished with hex or square nuts and various size plates and wedges.

IN WESTERN STATES

Pattin expansion shells are available and serviced exclusively by Colorado Fuel and Iron Corporation, Denver, Colorado. Western mining companies should contact them direct for information and consultation.

PATTIN

MANUFACTURING COMPANY
MARIETTA, OHIO

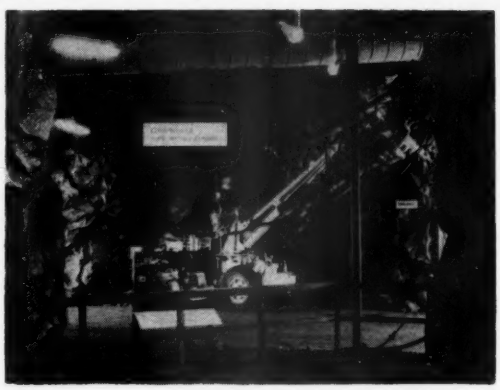
The PIONEER of roof bolting . . . established 1888

Alva Coal Corp. property at Black Star, Ky., has been purchased by Electric & Machine Supply Co. The purchase includes 12,000 acres of coal mining land, camp houses, and equipment. The mine, which shut down in June when it was producing 3500 tpd, was the largest non-captive mine in Harlan County. No plans have been made for reopening and the machinery purchased will be sold.

Huron Portland Cement has announced that productive capacity at its Alpena, Mich., cement plant, one of the world's largest, will be increased 16 percent within two years. The company plans to buy a new kiln and accessory equipment which will increase the plant's annual capacity by 2,000,000 bbl. Present capacity is 12,000,000 bbl a year.

The Cincinnati Gas & Electric Co. will build a sixth generating unit at its Walter C. Beckjord station at New Richmond, Ohio, where the company now is spending $50,000,000 on a fifth unit. The addition being planned will cost about the same as the fifth unit which is scheduled for completion in 1962. The sixth unit will be of equal size—250,000 kw—and will be started soon after the other unit is completed. When the fifth generating unit is completed, the plant's coal consumption will be increased 4000 to 6000 tpd. The sixth unit will bring it to about 10,000 tpd.

The ore-exporting town of Lulea, Sweden, has had a drive-in exhibition mine, presented it by a Swedish mining company, Luossavaara-Kiirunavaara AB (LKAB). The exhibition forms part of the 150th anniversary celebration of Norrbotten County. Its purpose is to convey some idea of the enormous



natural resources, especially of ore, forest and water power, lying within the boundaries of Norrbotten. No effort has been spared to give the drive-in mine every semblance of the real thing. It is built-up on a load-carrying tubular framework with wooden studs, and surfaced with bituminized paper both inside and out. Measuring 59 by 39 by 20 ft in size, the mine displays life-sized models of a rubber-tired drill, an airleg, a 14-ton truck, and the Alimak raise climber. An adjoining pavilion features a more conventional description in words and pictures of how ore is refined, dressed and concentrated, of different grades of ore, and with a model work train locomotive added for good measure. The pavilion also shows what LKAB is doing to make its operations more efficient and automatic.

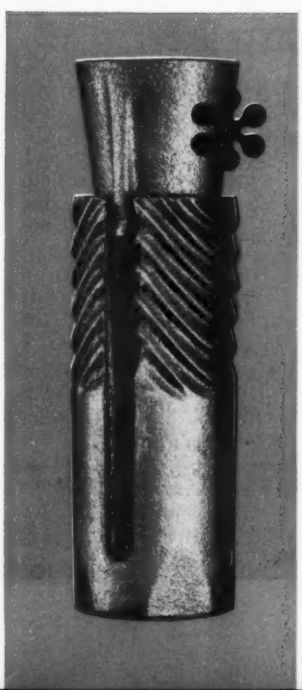
(*Continued on page 125*)

O-B Designs For Mining Men



RESULT:

A 4-way expansion unit that holds in soft shale or hard rock



4-WAY EXPANSION UNIT BUILDS HOLDING POWER FAST . . . because the flexible fingers of the shell are slightly pre-expanded to grip the wall even before wrenching begins.

GOES UP FAST AND STAYS PUT. When the bolt is shoved up the hole, the expansion unit holds the bolt in place until it's tightened . . . no need to have hands exposed to injury during wrenching.

GREATER STRENGTH IN HARD TOP . . . BETTER "PURCHASE" IN YIELDING TOP . . . because the expansion pressures are spread evenly over the four shell fingers to make the best use of the entire unit's strength. These are the reasons for the O-B Expansion Unit's popularity with mining men. It is easy to understand why more mine roof is supported with O-B Shells and Plugs than with any other kind.

For further information and prices, see your local O-B sales-engineer or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

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HOLAN

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

10048-M


H&L Teeth that really dig
CONTINUE TO SET THE PACE
WITH ANOTHER
FIRST
PAT. NO.
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NEW ..COMPLETELY FORGED
HIGH ALLOY (Super) STEEL
1 PIECE REPLACEABLE POINT
(FOR SHOVELS TO 9 YARD CAPACITY)
FORGING OF SUPER STEEL
ATTAINS UNIFORM GRAIN FLOW
WITH CONSTANT HARDNESS
THROUGHOUT POINT...
• RESISTS HIGH IMPACT
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H&L
30 YEARS OF
EXPERIENCE
DEVOTED
EXCLUSIVELY
TO THE
MANUFACTURE
OF
DIGGING TEETH
SEE YOUR LOCAL H&L DEALER
H&L TOOTH COMPANY
1340 SOUTH GREENWOOD AVE.
MONTEBELLO, CALIFORNIA

(*Continued from page 122*)

Fourteen executives of International Minerals & Chemicals Corp., and their wives, are making a 15-day, five-country tour of Western Europe as part of President Eisenhower's People-to-People Program for building friendships abroad. The tour, August 1 to August 15, sends the "good-will ambassadors" to England, France, The Netherlands, West Germany and Italy. One of the world's largest private suppliers of fertilizer ingredients, IMC is the first in the industry to send a people-to-people group overseas.

Production capacity of the U. S. uranium industry is already at a level that will not be matched by demands from operating nuclear power generating stations until the late 1980's, according to economists at Arthur D. Little, Inc., industrial research consultants. At the present time, most promising opportunities for uranium producers lie in reprocessing (to recover unused uranium from spent fuel), fuel-element fabrication, and refining.

Calumet & Hecla, Inc., plans to install a new $1,600,000 facility at Inkster, Mich., for the fabrication of "special" metals. Initially production at the Inkster plant will be confined to zirconium and titanium tubes and rods, with production of other metals, including tantalum, columbium, vanadium, molybdenum and chromium to be undertaken later. The new facility is slated to begin operations before the end of the year.

A 12 by 20-ft two-compartment H.M.S. drum for Greenwood Mining Corp. has been completed by WEMCO, division of Western Machinery Co. When installed in the new Greenwood breaker plant, it will be one of the largest drum-type separators in operation in the United States. The two-compartment drum will make possible separations at two different specific gravities in one operation, producing three products, a sink, a float, and a middling at predetermined and controllable specific gravities. It will be used to treat 6 by 9/16 in. anthracite coal.

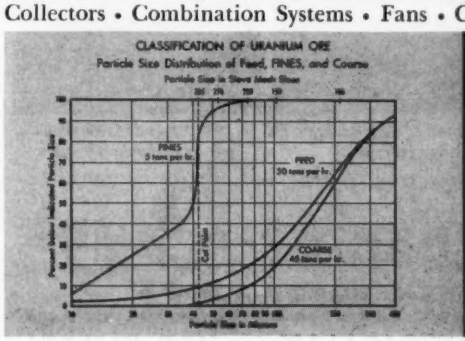
Republic Steel Corp. has closed its iron ore mine at Mineville, N. Y., because of the reduced demand for steel. This follows the closing during June of the company's other iron ore mining operation in the Adirondack region—the Chateaugay underground mine at Lyon Mountain, N. Y.

(*Continued on next page*)

CLASSIFICATION PROBLEMS SOLVED

at Booth 1515 - 1960 Mining Show - Las Vegas, Oct. 10-14

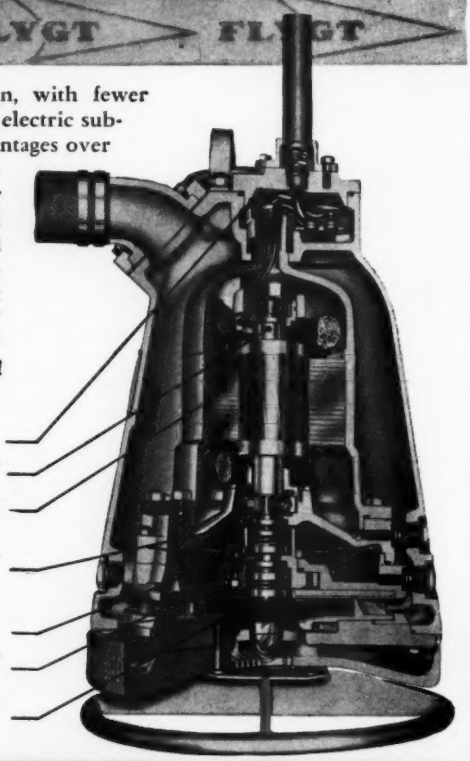
Buell will have 3 small-scale working models of Buell Classifiers at the Mining Show. In fact, if you have a small sample, bring it to the booth and we'll demonstrate the operation with your product. ■ Buell High Efficiency Classification Systems offer outstanding advantages in separating dry fine powdered or fibrous material from coarse material with unusually fine product range from 10 to 400 mesh. Standard capacities range from 100 pounds to 100 tons per hour of product feed. Complete literature available. Buell Engineering Company, Dept. 65-I, 123 William Street, New York 38, New York, Northern Blower Division, 6424 Barberton Avenue, Cleveland, Ohio. ■ Electric Precipitators • Cyclones • Bag Collectors • Combination Systems • Fans • Classifiers • Discharge Valves



buell Norblo

THE INSIDE STORY OF FLYGT SUCCESS

Simple, revolutionary design, with fewer parts involved, gives FLYGT electric submersible pumps definite advantages over ordinary pumps. This internal simplicity produces higher pumping capacity at costs well below conventional units. All cast parts are a special aluminum alloy; impellers to suit each application. Let FLYGT prove itself — ask for an on-the-job demonstration today!



1. Junction box
2. Shaft, journalled in SKF bearings
3. Electric motor, watertight enclosure, running in air
4. FLYGT mechanical seals for heavy-duty
5. Oil for cooling and lubrication
6. Rubber-lined, replaceable diffusers
7. Impeller of special alloy



1½" B–38 L running dry on construction job



3" B–80 L under water level on river job



6"–8" B–150/200 L on power house dam project

FLYGT Corporation HOOSICK FALLS, N.Y.



Visit FLYGT at the AMC Mining Show Booth 1016

WESTERN SALES & SERVICE: STANCO MGFS. & SALES INC., 1666 Ninth St. (CORNER OF OLYMPIC) SANTA MONICA CALIF.

PUMP BETTER ELECTRICALLY — USE FLYGT!

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SUBMERSIBLE PUMPS

For Sale—Byron Jackson Submersible Pumps and Controls, Six 12-stage, 3 CKH Vertical, and four 3 stage, 18 CKXL Incline. Good operating condition; priced right. Contact W. A. Barz, Calumet Division, Calumet & Hecla, Inc., Calumet, Michigan.

REPRESENTATIVE WANTED

in your territory. From your desk you can earn a substantial addition to your income. Only written contacts with your clients! Write for particulars and further details to

VKK-Office
Vienna 66, P.O.B. 128, Austria



ACME HI-LIFT

MODEL HSHL-4B

For Best Results In High-Vein Roof Bolting

The ACME (Model HSHL-4B) HI-LIFT is an innovation in modern mining technique designed to facilitate roof control in high-vein mining operations. The ACME HI-LIFT is a four-wheel drive, tractor type steering, unit with an elevating drilling deck on which are mounted two traveling and traversing Le Roi S12VT Nu-Matic stopers. The elevating platform enables the operator to work at the most convenient height for greatest efficiency. The stopers move on a traveling rail thereby permiting drilling at virtually any spot on the platform. The drills are of the integral dust collecting type and the dust collectors are mounted beneath, and on the sides of, the platform. Safety timbers can be placed between the platform and the roof to afford protection to the operator from roof slabbing and falls. The platform will support a 30,000 pound weight and can be tilted 15 degrees front to back. In addition the ACME HI-LIFT has four leveling jacks with an effective stroke of 10″ for leveling in bad bottom or on high grades. Two complete sets of controls are furnished as standard equipment, one being on the platform and one on the tramming deck. A powerful 40 HP motor drives the complete hydraulic system for the unit.

COMPLETE SPECIFICATIONS WILL BE GLADLY FURNISHED UPON REQUEST

ACME MACHINERY COMPANY

ACME BUILDS A DRILL RIG TO SUIT YOUR MINING CONDITIONS

ACME MACHINERY COMPANY

HUNTINGTON, WEST VIRGINIA

WAREHOUSE AND SALES OFFICE
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REPRESENTATIVES IN PRINCIPAL MINING AREAS

OUR *Fiftieth* YEAR

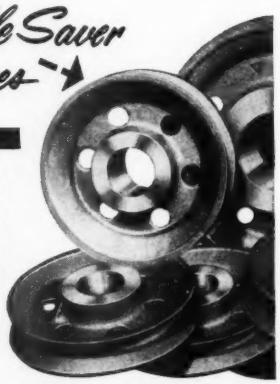
FARRELL-CHEEK
SHEAVES and Wire Rope Fittings



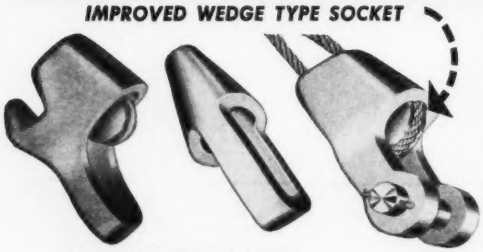


Cast Steel and 50 years of know-how in using it account for the superiority of Farrell-Cheek sheaves and wire rope fittings. Actual service in the field readily confirms all claims.

Cable Saver Grooves



IMPROVED WEDGE TYPE SOCKET



SNATCH BLOCK SOCKET

STANDARD TYPE SOCKET

Sheaves with Cable Saver Grooves and unmatched resistance to fatigue and wear ★ Choker Hooks of great strength and utility ★ Standard, Wedge Type and Snatch Block Sockets of many performance features ★ Clips, Thimbles and Eye Hooks . . . all electric furnace cast from Farrell-Cheek carbon and F85 alloy steels.

You'll find the entire line in CATALOG 22, complete with specifications.

WRITE TODAY.

VISIT US AT BOOTH 905, AMC SHOW—LAS VEGAS

F85

FARRELL-CHEEK STEEL CO.

110 LANE STREET, SANDUSKY, OHIO

Finest Name in Cast Steel!

"Step Up" Screening Capacity with

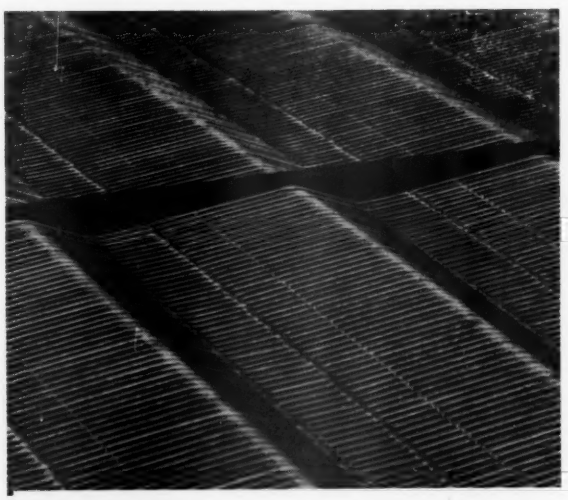
CASCADE

"STEP" CONSTRUCTION!

Now you can almost double your small coal screening capacity and eliminate flooding caused by overloads. Hendrick's new Wedge Wire CASCADE Screen has a special "step" construction that breaks up the flow layer and causes a tumbling action to greatly improve dewatering efficiency.

CASCADE increases draining to such an extent that you can use smaller screens to achieve the same throughput as before and save on space and material costs. Hendrick Wedge Wire CASCADE Screens are furnished with openings from ¼ to 1 m.m., in anti-corrosive stainless steel. For more information, mail in the coupon today!

PERFORATED METAL SCREENS • WEDGE WIRE SCREENS • CASCADE WEDGE WIRE SCREENS
WEDGE SLOT SCREENS • RUBBER CLAD PERFORODE SCREENS • FLANGED LIP SCREENS
FLIGHTS • SHAKER AND CONVEYOR TROUGHS



Hendrick MANUFACTURING COMPANY

62 Dundall Street, Carbondale, Penna.

Gentlemen: I am interested in learning more about Wedge Wire CASCADE Screens.

☐ Please send me FREE booklet.

☐ Please have representative call.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

ASEA's new multi-rope friction mine hoists for installation in one of the largest mines take an unbalanced load of 55 tons at a speed of 2760 feet per minute—twice the load of any known hoist at this record speed.

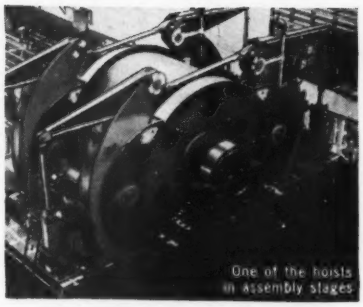
Here are two major advantages of these new mine hoists pioneered by ASEA for mine owners everywhere.

1 **MULTI-ROPE FRICTION DRIVE;** this enables a moderate sized pulley (length, 7'2", diameter, 12'2") to take a very high unbalanced load with ease.

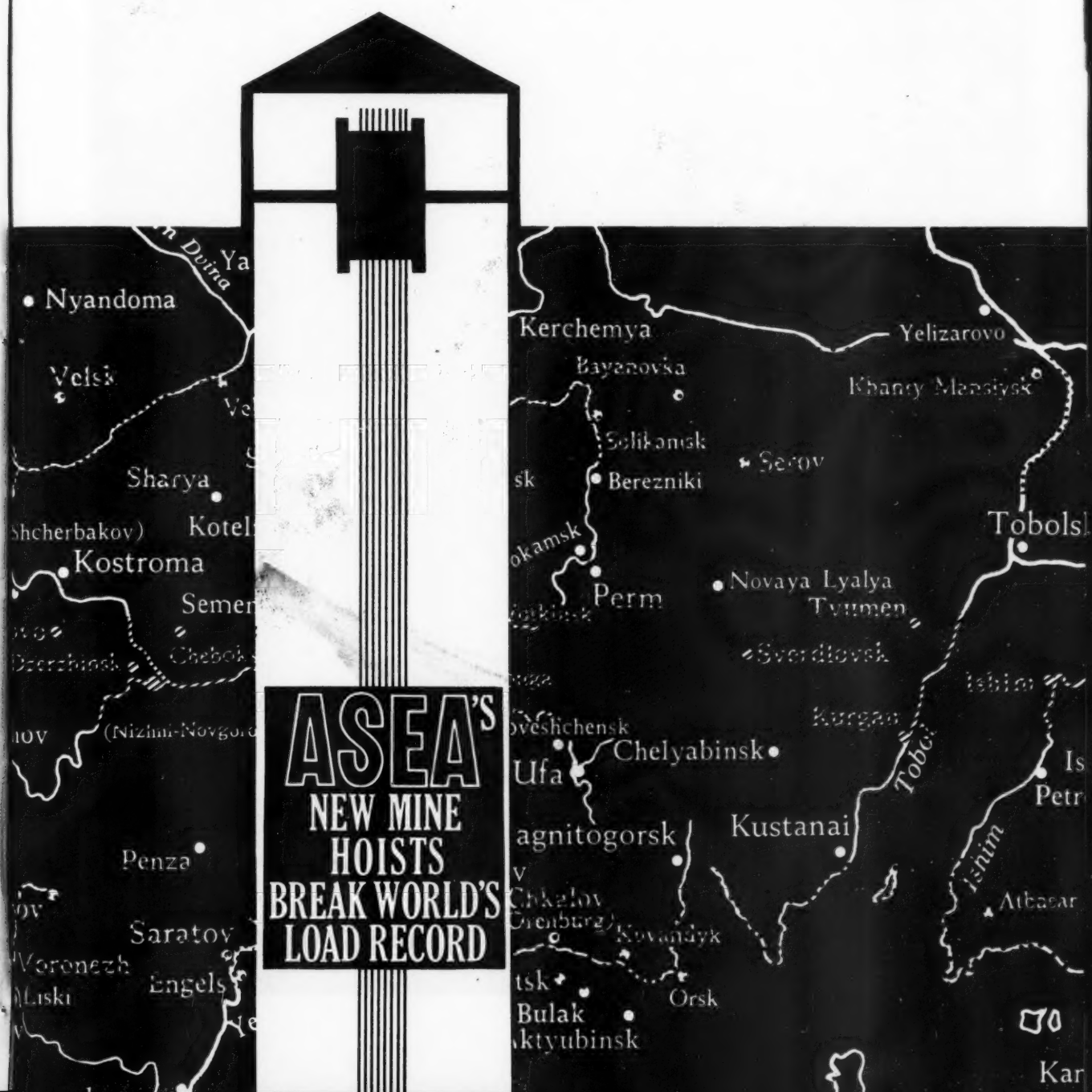
2 **FULLY AUTOMATIC OPERATION,** which can save as much as $30,000 a year per hoist at prevailing U.S. wage rates, assuming two-shift operation.

Make profitable use of ASEA design and engineering experience. Let ASEA save operating costs—in a big way just as it saves for 14 U.S. and Canadian mining companies. Write for literature to: ASEA ELECTRIC INC. 500 Fifth Avenue, New York 36, New York and 55 New Montgomery Street, San Francisco 5, California.

TECHNICAL DATA			
Hoisting	Double Skip	Hoisting speed	2760 ft. per min.
Hoisting capacity	1400 tons per hour	Number of ropes	8
Net load	55 tons	Rope Diameter	1¾"
Skip weight	44 tons	Diameter of Pulley	12'2"
Depth of shaft	3940 ft.	Length of Pulley	7'2"
		Motor output	12,000 h.p.

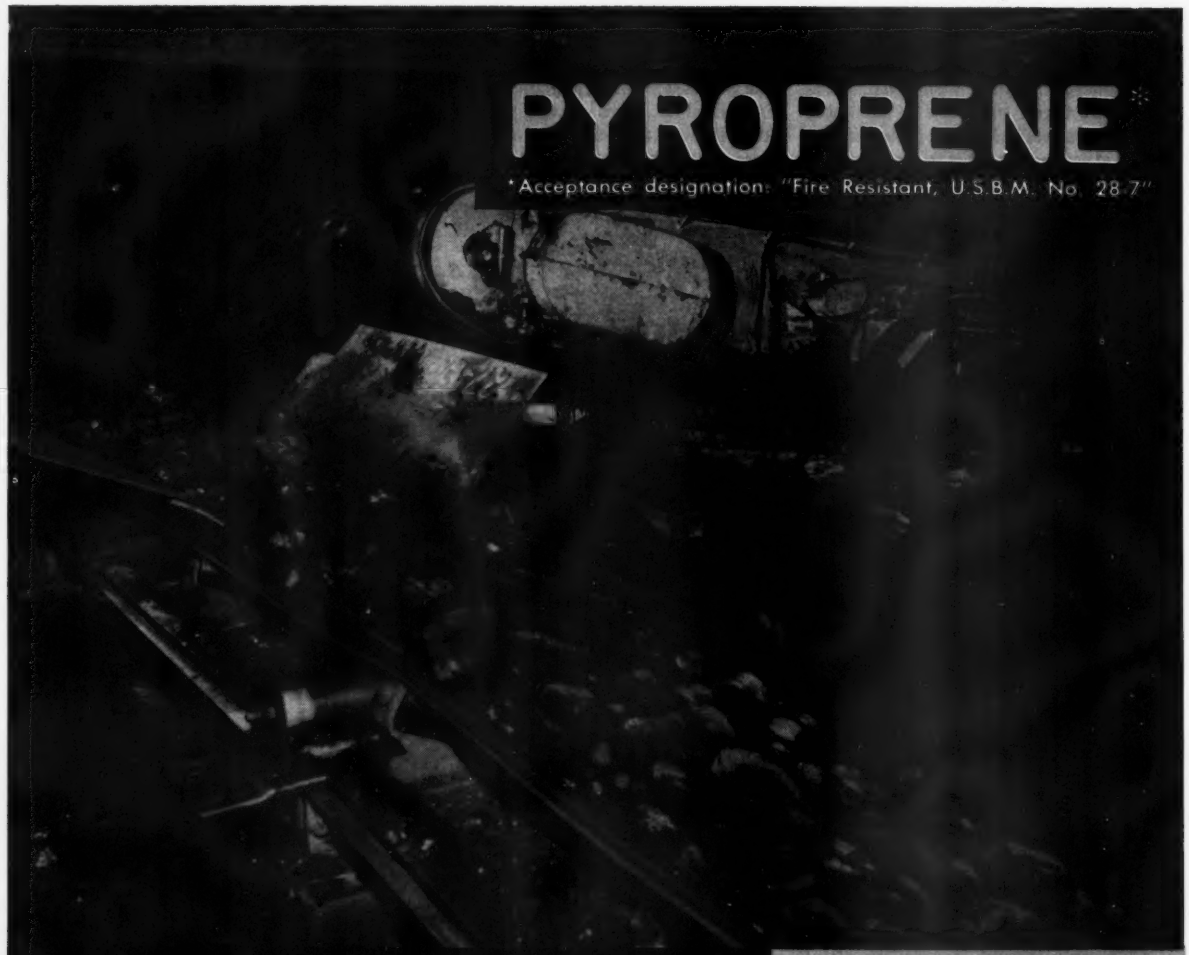

One of the hoists in assembly stages

ASEA'S NEW MINE HOISTS BREAK WORLD'S LOAD RECORD



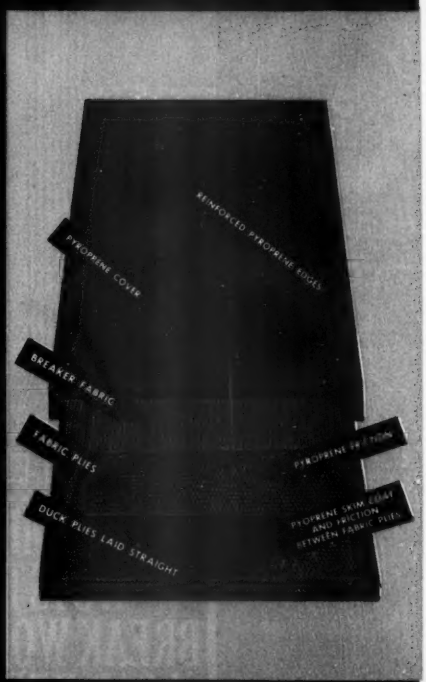
PYROPRENE*

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"



This belt is a whipping boy for coal mines

The industry asked for a conveyor belt that would resist fire *and* absorb the brutal punishment of underground service in coal mines. Acme-Hamilton engineers answered this challenge with PYROPRENE—a fire-impervious synthetic rubber. Acme-Hamilton's PYROPRENE belt gives maximum protection against abrasive action, oils, acid and mildew. A breaker fabric of tough *cord-locked* construction safeguards it against *shock* and *impact*. A skim coat of Pyroprene rubber between all plies, covers and carcass affords complete adhesion and protection against ply separation. Reinforced Pyroprene rubber edges guards edge-wear. For further information write Acme-Hamilton, Dept. C1.



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An Invitation

TO PROFIT-MINDED MAINTENANCE MEN

If . . . you are really concerned about equipment wear and replacement costs, and you want more efficient maintenance, faster repairs and longer service life . . .

Then . . . BOOTH 800 at the AMC Metal Mining Show, Las Vegas, October 10–13, should be a MUST on your schedule of things to see because here you will find . . .

WEAR-O-MATIC

HARD SURFACING PROCESS

Wear-O-Matic, the newest, fastest growing process for semi-automatic application of build-up and hard surfacing alloys, outperforms standard application methods in every respect. Wear-O-Matic utilizes straightening rolls and positive feed drive rolls to provide an uninterrupted supply of wire to the welding tip from the 100 pound WELD-PAK wire package. WELD-PAKS, revolutionary method for packaging wire, are easier to handle, easier to store and require less time for set-up or change than any packaging method previously devised. A snap of the lid seals unused wire against dust, dirt and weather. The Wear-O-Matic process is the most significant advance in the application of wear resistant alloys in recent years, offering greater economy, efficiency and higher quality deposits.

Take advantage of this opportunity to compare the Wear-O-Matic hard surfacing process with other methods and alloys. See how easily and inexpensively Wear-O-Matic will revitalize your maintenance program.

If you will not be attending the Mining Show, write for descriptive Wear-O-Matic literature to Alloy Rods Co., P. O. Box 1828, York Pa.

ALLOY RODS COMPANY

YORK, PENNSYLVANIA

SALES OFFICES & WAREHOUSES; BOSTON, NEWARK, PHILADELPHIA, PITTSBURGH, BIRMINGHAM, CHICAGO, SAN FRANCISCO & EL SEGUNDO, CALIF.—DISTRIBUTORS IN ALL OTHER PRINCIPAL CITIES

TWENTY YEARS OF LEADERSHIP IN THE DEVELOPMENT OF QUALITY ALLOY ARC WELDING ELECTRODES

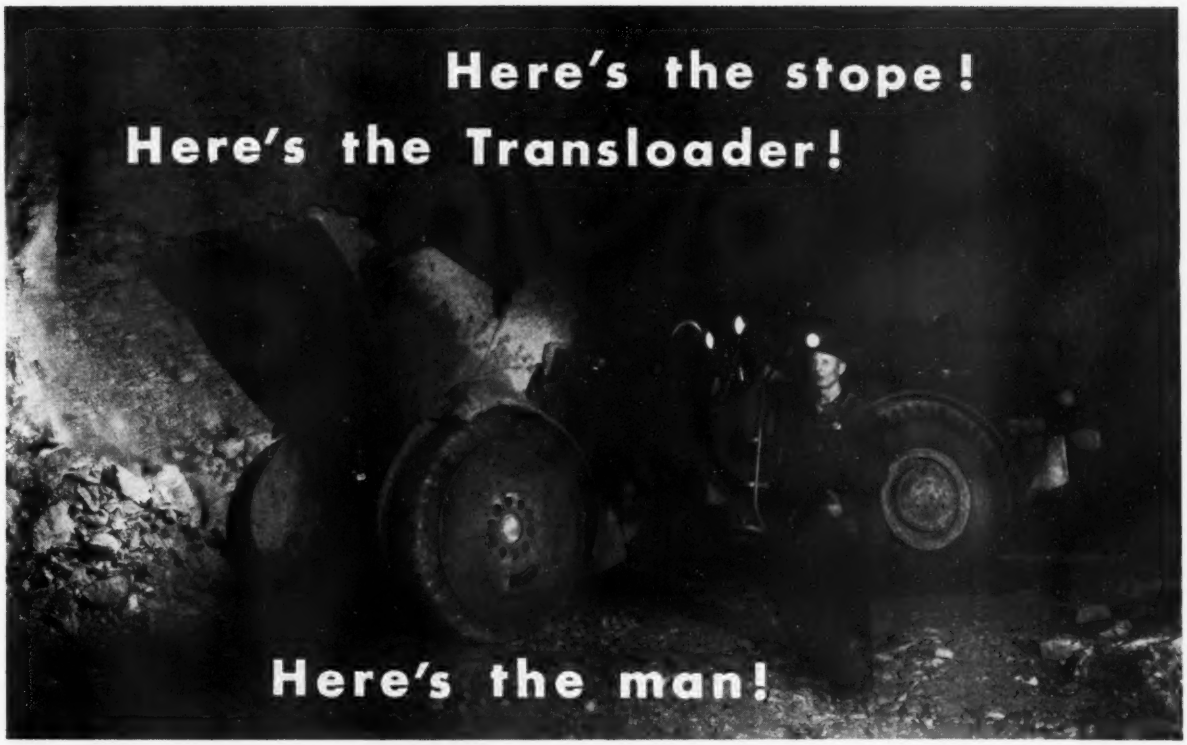
It is difficult to believe—but the truth is...

This S-D TRANSLOADER LOADED, HAULED and DUMPED 1,045 TONS in one shift!

THIS WAS NO TEST nor demonstration. This customer and user was backstoping. Several thousand tons had been shot. S-D Transloader operator Robert White was simply loading, hauling, and dumping as usual with his self-loading transport. The one way tram to dump hole was 150 feet. (S-D Transloader also operates more effectively and more efficiently than conventional equipment on long hauls.)

AT THE END OF THE SHIFT MR. WHITE HAD MOVED 1,045 TONS OF HARD ROCK! That was 190 loads! On the following night shift he loaded 180 times for 990 tons. He moved 2,035 tons in two consecutive night shifts!





THE FACTS ARE, FURTHER, that the S-D Transloader requires (1) the *lowest* original cost for tons handled . . . (2) *lowest* maintenance, due principally to extremely simple design . . . (3) *least* ventilation due to low horsepower to work done . . . and (4) *lowest* labor cost per ton!

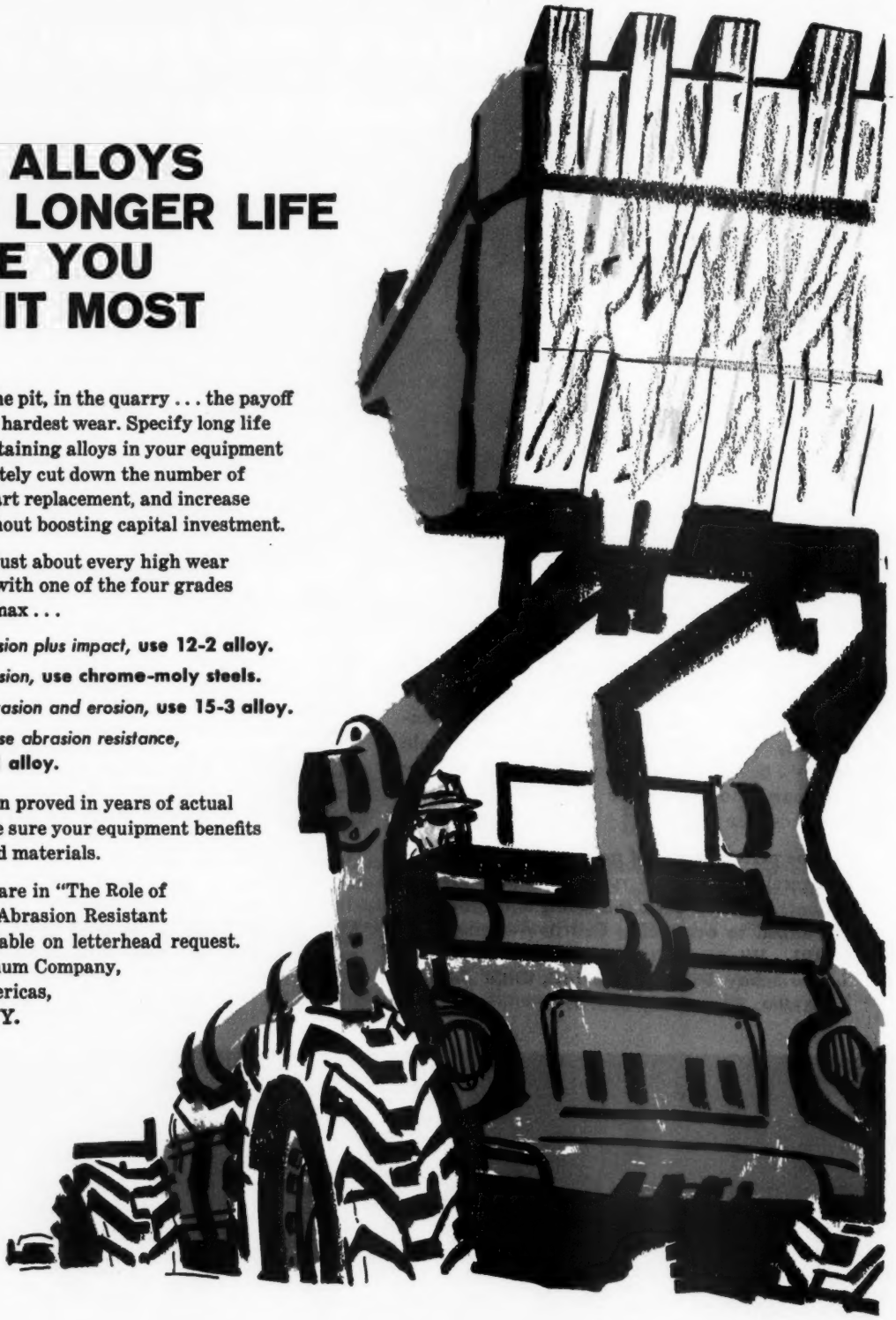
The performances of many S-D Transloaders in several mines justify *your immediate* investigation! The Transloader is doing a job you cannot afford to overlook! Call us — today . . . 3-4191. Wire or write:
Sanford-Day Iron Works, Inc., Dale Avenue, Knoxville, Tennessee, U.S.A.

WE WILL BE AT LAS VEGAS . . . with the S-D Transloader! At our Sanford-Day BOOTH 43, in addition to the Transloader, you will be able to view documentary movies showing exactly what the Transloader is doing *in action* underground to increase production at tremendous reduction in cost! We invite you to visit with us at BOOTH "43" . . . American Mining Congress, MINING SHOW, Las Vegas, Nevada, Monday-through-Thursday, October 10-13, 1960.

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MOLY ALLOYS MEAN LONGER LIFE WHERE YOU NEED IT MOST



In the mine, in the pit, in the quarry . . . the payoff is at the point of hardest wear. Specify long life molybdenum-containing alloys in your equipment and you immediately cut down the number of shutdowns for part replacement, and increase productivity without boosting capital investment.

You can satisfy just about every high wear rate application with one of the four grades developed by Climax . . .

For gouging abrasion plus impact, **use 12-2 alloy.**

For grinding abrasion, **use chrome-moly steels.**

For scratching abrasion and erosion, **use 15-3 alloy.**

For general purpose abrasion resistance, **depend on 3-2-1 alloy.**

All four have been proved in years of actual mining use. Make sure your equipment benefits by these advanced materials.

Complete details are in "The Role of Molybdenum In Abrasion Resistant Materials", available on letterhead request.
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NEWS and views



U_3O_8 Purchase Contract Extended

A uranium concentrate purchase contract between the Atomic Energy Commission and Homestake-Sapin Partners, operators of a 1500 tpd uranium processing mill near Grants, N. M., has been extended to December 31, 1966. The new contract replaces an agreement that would have terminated on June 30, 1963 and is in accordance with the AEC announcement of November 24, 1958 which provides for purchases of U_3O_8 in the 1962 to 1966 period from ore reserves developed prior to November 24, 1958. In addition to containing a provision which reserves a portion of the mill capacity for independent ore producers in the area who had established reserves prior to the November 1958 date, it provides for a deferral of part of the pre-1962 production from company controlled properties to the 1962-66 period. Homestake-Sapin Partners is a limited partnership consisting of Homestake Mining Co. and Sabre-Pinion Corp. The Partners' first concentrate delivery to the AEC was made in September 1958 under a contract signed in April 1957.

350,000-KW Coal-Burning Power Plant Proposed

A $100,000,000 coal burning steam-electric plant and power transmission system has been proposed for erection on the Navajo Indian Reservation in Arizona. Arizona Public Service Co., which recently began construction of a $19,000,000, 110,000-kw coal-burning generating plant near Joseph City, Ariz., would erect a 350,000-kw generating plant on 1250 leased acres near Shiprock, N. M. The company would obtain fuel from undeveloped sub-bituminous coal reserves on about 24,000 acres of tribal lands under lease to Utah Construction & Mining Co. The proposal, which is reported to have been approved by the Navajo Tribal Council, has been submitted to the Department of the Interior for approval. About 30 months would be required to complete the project.

McKee to Acquire Western Machinery

The Western Machinery Co., West Coast manufacturer of mineral and chemical processing equipment who is also engaged in engineering and construction and sale of materials handling machinery, will be acquired by Arthur G. McKee & Co. of Cleveland, Ohio. Although details of the transaction remain to be settled, the acquisition will be accomplished through the use of cash and notes and will not involve issuance of additional McKee shares. Western Machinery, with assets in excess of $10 million, will be operated as a subsidiary of McKee, an international construction and engineering company for the steel, petroleum and chemical industries. There will be no changes in present management or personnel.

ALSO . . .

About $3,000,000 will be spent by Southwest Potash Corp., a subsidiary of American Metal Climax Inc., to expand capacity for production of muriate of potash from its Carlsbad, N. M., mine. While details of the expansion were not revealed, it was announced earlier that the company would operate a $7,000,000 nitrate of potash plant at Vicksburg, Miss., slated to be in production in October 1961. The Vicksburg facility, which is to be constructed by American Metal Climax, will utilize muriate of potash in a new process developed in a pilot plant operation.

Activities of the Bureau of Mines Reno, Nev., Office of Mining Research for the current fiscal year will include studies on mining boron minerals. The studies will center around differential movements of open pit slopes, particularly near faults, and the study of ground pressures in borate ores and enclosing beds at various depths, which result from extension of underground openings and removal of overburden.

The Bureau has also announced that its Spokane, Wash., office will field-test a redesigned phosphate-rock planer in cooperation with Western producers of phosphate rock in Wyoming, Utah, Montana, and Idaho.

Rosebud Coal Co. of Hanna, Wyo., recently was awarded a contract to furnish 1,500,000 tons of steam coal to the Public Service Company of Colorado over a six year period.

Tentative power allocations in the Pacific Northwest will permit fulfillment of proposals for continued industrial expansion in that area. Bonneville Power Administration is reported to have recently allocated power to United Pacific Aluminum Corp., Harvey Aluminum, Inc., and Webb & Knapp Co., Inc. that will make it possible for United Pacific to carry out plans to build two potlines near Longview, Wash. Similarly, Harvey can proceed to expand reduction capacity of The Dalles, Ore., plant 25 percent by installing two new potlines. Webb & Knapp plans to use its power allocation for operation of a plant at Anaconda, Mont., to recover copper, zinc and iron from smelter slags.

A method of treating recently discovered beryllium ores of the Topaz Mountain area of Utah has been reported. Beryllium Resources, Inc., has devised a process which it says will make possible a commercial mining operation in the Topaz area. De-

(More on page 138)

FOR ASSURED CONTINUITY OF OUTPUT—NEW ANACONDA

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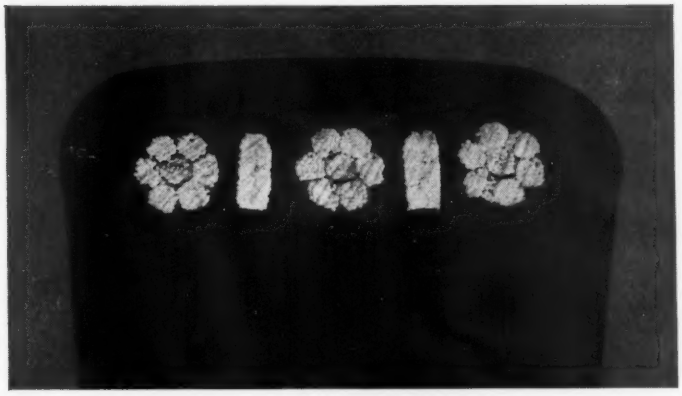
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ABOUT THE NEW AC SHUTTLE CAR CABLE

(*Continued from page 135*)
posits which the company controls are amenable to "conventional, low-cost mining methods."

"A Glossary of the Diamond-Drilling Industry," which defines about 5000 words and symbols common to the industry, has been prepared by the U. S. Bureau of Mines. An appendix contains tables comparing present and former standards established by the Diamond Core Drill Manufacturers Association and shows steps in developing nomenclature of diamond-drill fittings. The glossary, Bureau of Mines Bulletin 583, can be obtained for 35 cents a copy from the Superintendent of Documents, Printing Office, Washington 25, D. C.

The Anaconda Co. is reported to have acquired 12 square miles of leases, with options to purchase, in the Milford area of Beaver County, Utah, where it will conduct exploration for mineable copper deposits.

Carey Salt Co. of Hutchinson, Kans., has leased certain underground areas to a storage firm who has contracted with business firms to store records, microfilm and magnetic tape in vaults which are currently being completed there. The company earlier had been reported to have leased other underground areas to the Atomic Energy Commission which is investigating salt beds as a storage area for radioactive wastes.

Mining activity will be resumed about October 1 by Rare Metals Corp. of America at its San Mateo shaft near Grants, N. M. The company, an affiliate of El Paso Natural Gas Co., recently completed rehabilitating the shaft, which had "collapsed" earlier this year.

The Susquehanna Corp. has formed a Canadian subsidiary, Susquehanna Metals, Ltd., through which it has entered into an option lease arrangement with Raindor Gold Mines, Ltd. The new subsidiary has commenced a program for exploration and possible development of Raindor properties near Revelstoke, B. C., which contain deposits of lead, zinc, silver and gold. Susquehanna will exercise its option only if sufficient ore is proven to support an integrated mining and milling operation.

Pilot plant experiments involving the use of oxygen in the smelting of copper ores are planned by Kennecott Copper Corp. at its Garfield, Utah, smelter. With contracts for about $750,000 in pilot plant equipment said to have been let, the experiments will be concerned with introduction of oxygen into reverberatory furnaces to speed-up processing time. Some small-scale testing has already been conducted at the company's Chino Mines Division at Santa Rita, N. M.

The sixth annual Rocky Mountain Minerals Conference will be held October 5 to 7 at the Newhouse Hotel, Salt Lake City, Utah. The program will include presentation of papers on several subjects of current interest to mining people, an exploration symposium, and a field trip to the Bacchus rocket fuel plant of Hercules Powder Co.

The Bunker Hill Co. and Washington Water Power Co. are conducting an experiment on the utilities' natural gas pipelines hoping to devise a cathodic protection system which utilizes zinc anodes. Zinc cathodic protection has been used in such cities as Houston, Texas, and Charleston, S. C., where the soils are highly corrosive and very conductive. The present test is to determine if the system can be successfully applied in less conductive soils.



First pours of concrete have been completed in the 100 by 100 by 117 ft primary crusher excavation on the Mission Project of ASARCO near Tucson, Ariz. The newly opened copper pits in the near background will soon expose ore for dumping into the huge 3200 tph crushing system. Most of the WKE construction operations originate from the 50 ft "shelf" with crews of men on the two levels below. A constant surveillance is maintained on the sheer walls of the excavation. Practically no caving has been experienced to date even though constant blasting in the stripping operations is only about one-half mile distant

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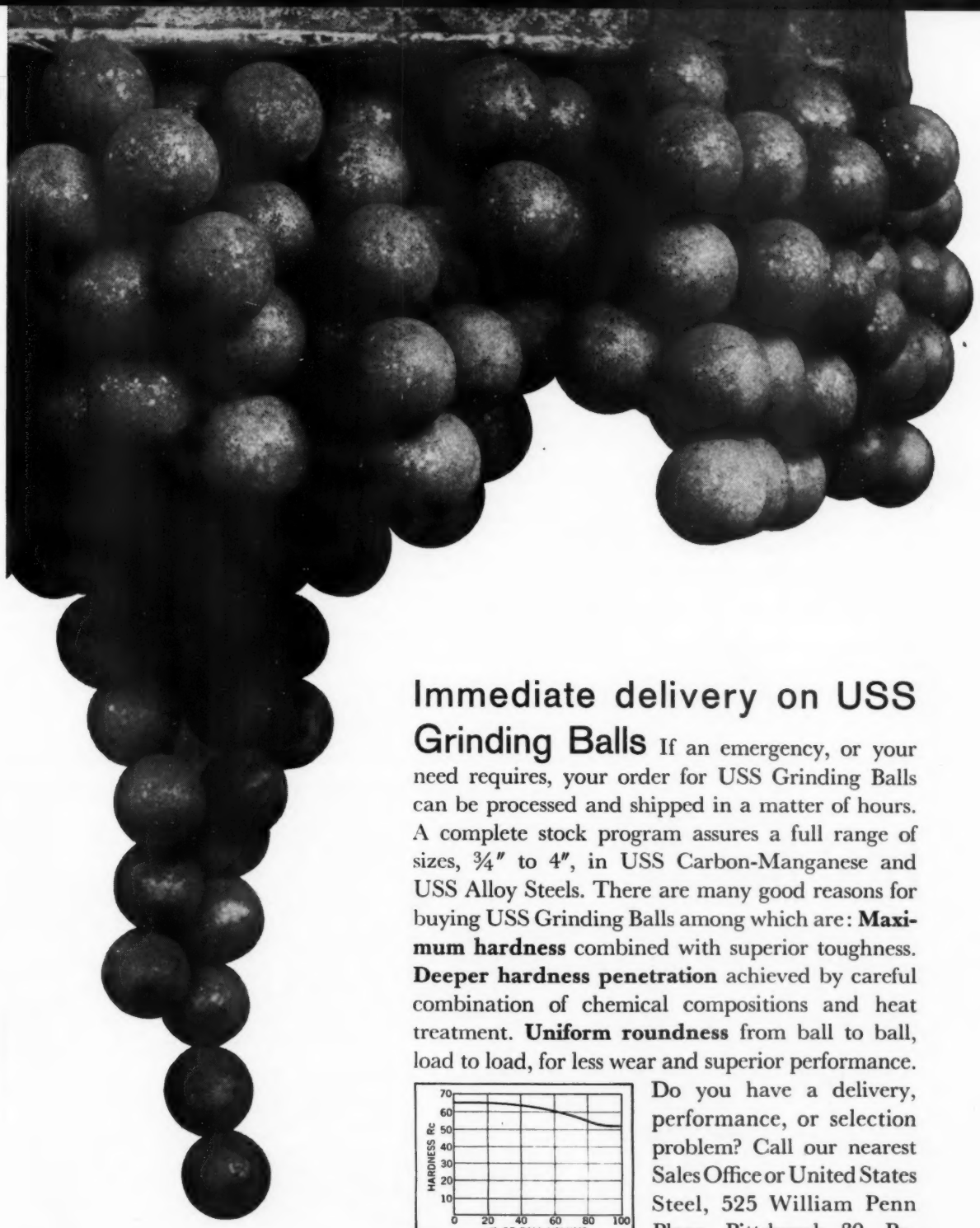
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A long-term agreement under which Texas-Zinc Minerals Corp. will mill ores from the Big Buck mine of Standard Metals Co. in San Juan County, Utah, has been signed. Texas-Zinc, operator of a concentrator at Mexican Hat, Utah, will mill ores from the Big Buck mine containing in excess of 2.8 million lb of uranium oxide during the period July 1, 1960 to December 31, 1966. Texas-Zinc's contract with the Atomic Energy Commission covering the Mexican Hat mill provides that at least 50 percent of the mill's capacity will be reserved for independent producers.

A 120 tpd processing mill for treating concentrates containing precious and other metals by the so-called Masero process was recently placed in operation at O'Brien in Josephine County, Ore., by Minerals Reduction, Inc. The company is currently processing black sand concentrates made from tailings at the nearby Esterly mine by Journey's End Corp.

The Office of Minerals Exploration recently approved a $47,550 contract with Brennan Hannifin for lead, zinc and copper exploration in Jaub County, Utah. Other OME contracts recently approved include those with Shasta Minerals and Chemical Co. for $89,620 and Tri-State Metals Corp. for $25,360. Shasta Minerals will explore for copper and zinc in Shasta County, Calif., while Tri-State will explore for beryl and tantalum in Taos County, N. M. In each instance, the Government's participation will be one half the estimated cost previously noted.

Additional sinking operations are being planned at the Conjecture mine in Bonner County, Idaho. New equipment is being installed which will permit sinking 1000 ft more to the 2000 ft level. The mine is under development by Federal Resources Corp. on a profit sharing basis with Conjecture Mine, Inc.

Nez Perce Cement Corp., recently incorporated in Idaho, has proposed erection of a cement plant at a limestone quarry in Mission Creek Canyon, Idaho, on properties owned by the Nez Perce Indians. Until early this year the quarry had been operated by Lewiston Lime Co. Development of the facilities might require $15,000,000.

About one-sixth of the employes of the Utah Copper Division of Kennecott Copper Corp. have worked 20 or more years without a lost-time accident. Nearly 1200 employes of the division are represented in the achievement. Twenty-three employes have worked 40 years or more without a disabling injury, 305 for 30 years or more and 865 for 20 years or more. Joe McDonald, a shovel operator, is the division record-holder with 52 years of service without suffering a lost time injury.

The Colorado Fuel & Iron Corp. has announced the successful conclusion of permit and option negotiations with the White Mountain Apache Tribe granting the company an exclusive prospecting permit and option to lease Apache Indian land in Arizona. The permit covers 188 sq miles in the northwestern section of the Fort Apache Indian Reservation and gives CF&I the right to prospect for all minerals except oil and gas. The permit is for two years, with the right to extend it for an additional two years if desired.

General offices of Western Nuclear, Inc., operators of an 845-tpd uranium mill near Jeffrey City, Wyo., have been moved from Rawlins, Wyo., to the Denver-U. S. National Bank Center, Denver, Colo. The company will establish an operations office at Rawlins.



The nation must look to its storehouse of natural resources for continued growth, and **The Hidden Splendor Mining Company** is proud to be a part of the industry that is developing these resources.

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A copper mine on Vancouver Island, B. C., owned by Coast Copper Mines, Ltd., may be developed for production if reported plans of Consolidated Mining and Smelting Co. materialize. Cominco, who controls Coast Copper, would buy additional shares of the company for financing mine development, erecting a concentrator and other facilities at the property. Coast Copper was organized in 1916, but the mine has never produced.

A 50 tpd gravity concentrator is to be installed at a tungsten and tin deposit at Silver Hill near Spokane, Wash. The deposit, which formerly belonged to the Spokane Tin Mines Co., is owned principally by Carl A. Coon, and Daybreak Uranium, Inc., is said to have a ten percent interest in it. Plans of Coon call for shipping tungsten concentrates to the Glen Cove, N. Y., plant of Wah Chang Corp. Tin concentrates would go to the Wah Chang's Texas City, Texas, tin smelter.

Idaho College of Mines alumni will have a "get-together" breakfast in the Hickory Room of the Riviera Hotel at 8:00 A.M. on Tuesday, October 11, during the AMC Mining Show in Las Vegas, Nev.

A lead-silver deposit at the Plowboy mine near Priest Lake in north Idaho will be developed according to plans of Selkirk Mining Co. The company expects to strip mine the ore with high grade going to a smelter and low grade being truck to a concentrator.

Goldfields Consolidated Mines Co. is reported to have recently purchased 42.6 percent of Getchell Mine, Inc., Nevada tungsten and gold producer which is presently idle. The transaction was said to involve 639,000 shares of Getchell.

A statistical report of the copper industry in 1959 has been prepared by the Arizona Department of Mineral Resources. Entitled "Statistics for 1959 Compared with Other Years, Arizona, United States and Free World," it is largely a compilation of data from several authoritative sources. The report is divided into two parts: Part I—Copper Industry, and Part II—Copper Industry in Arizona. A copy may be obtained from the Arizona Department of Mineral Resources, Minerals Bldg., Fairgrounds, Phoenix.

To define more adequately the scope of its activities, the Heavy Construction Division of Henry J. Kaiser Co. has been renamed Kaiser Engineers International, division of Henry J. Kaiser Co. The newly named division will be headed by John Hallett as general manager. Hallett, a vice president of Henry J. Kaiser, will be responsible for all engineering and construction activities outside the United States and Canada, while L. H. Oppenheim, vice president and general manager of Kaiser Engineers, will be responsible for the company's industrial engineering and heavy construction activities and projects in the U. S. and Canada. Projects the company is currently working on include a cement plant in Hawaii, periclase plant in Michigan, iron ore concentrator in Canada, and an iron ore concentration pilot plant in Labrador.

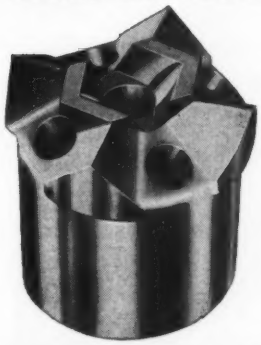
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Both bits have strong taper connections. The TEE CEE bit and steel bit with class A socket both fit drill rods with class A connection. The TEE CEE bit and steel bit with the class B socket both fit drill rods with class B connection.

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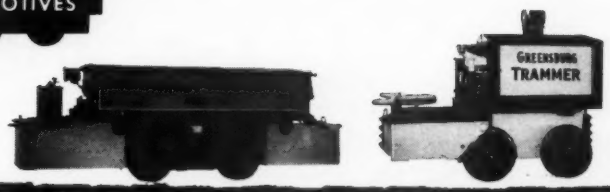
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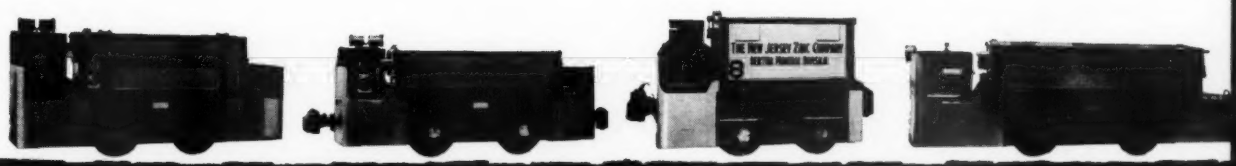


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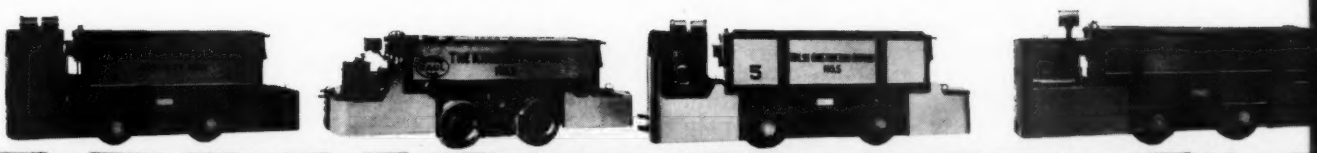
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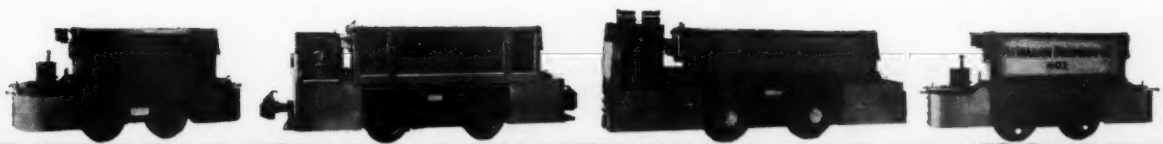
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By replacing the power plants on five of its nine 65-ton diesel locomotives with Caterpillar D353 Diesel Engines, 11-car trains can now be hauled on round trips of 24 miles compared to only nine before repowering. Each train hauls about 550 tons of bank-run material from the pits to the processing plant, a 25 per cent increase over the old capacity. The 0.85 per cent grade with the full load offers no problems for Cat Engines.

Five trains used to be needed to maintain production compared to today's four, which meant two additional sidings for main-line passing. This kind of operation has enabled the company to pay off the power conversion in less than a year's time and given it a more profitable outlook for the future.

Here is more proof that Caterpillar Engines are your best repowering investment. Post-installation performance justifies the choice down the line. And all this comes from an investment that's only a fraction of that for purchasing new equipment to replace the entire unit.

When you repower with Caterpillar Diesels, you can save several thousands of dollars on fuel alone, compared to the cost of gasoline. You save on maintenance because Cat Engines require minimum care. Service and parts are quickly available from your nearby Caterpillar Dealer.

He can help you make the right choice . . . whether you repower locomotives with a minimum investment, or purchase new equipment from the many manufacturers who insist on Cat Engines. Either way you gain the unique advantages available from Caterpillar. Ask your Caterpillar Dealer for the facts. Or write for the free booklet, "Caterpillar Engines for Railroad Power."

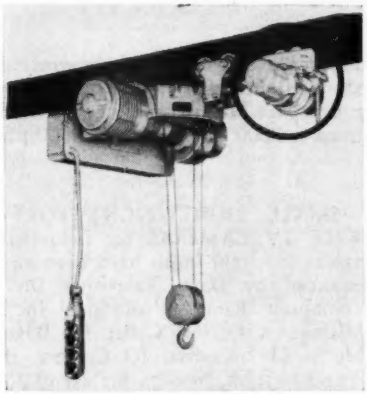
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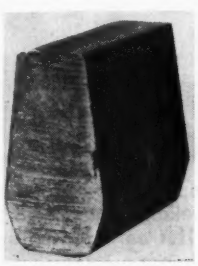
A MONORAIL "HOIST-TRACTOR" recently introduced by Harnischfeger Corp., Milwaukee, Wis., and known as the P&H Pull-a-Hoist, is said to be capable of pulling loads of 13,000 lb at speeds up to 60 fpm.



It has been designed to power any make of hoist along any standard I beam or wide flange beam. Operating features claimed include an oil-smooth adjustable torque brake and a "soft-start" motor which minimizes any tendency of load jerking or swaying. The unit weighs 83 lb, requires 12 in. of headroom and uses 13 in. of rail space for "end approach."

A POCKET SIZE TWO-WAY RADIO, fully transistorized and designed for both commercial and recreational activities, has been introduced by Ross Laboratories, Inc., 124 Lakeside Ave., Seattle 22, Wash. Called the Pocket Talkie, it operates under a special provision of the 27-megacycle citizens band which requires no license or permit.

GROUSER BARS, called Sur-Trac, have been developed by American Steel Products Corp., 8700 Kinsman Rd., Cleveland 4, Ohio, to cut costs of reconditioning worn grouser pads. The worn grouser is cut or ground even and the Sur-Trac bar welded in its place. These bars can be applied without dismantling the track, and they are reportedly designed for complete weld penetration with a minimum of weld metal. They can be welded by hand or automatically.



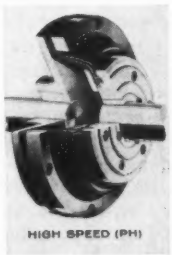
A HYDRAULIC CONTROL UNIT —the 165—is available without externally mounted valves for the D8H tractor of Caterpillar Tractor Co., Peoria, Ill. Another change is a new high pressure hydraulic oil filter containing one five-in. element. The filter housing is partly recessed in the operator compartment deck adjacent to the hydraulic tank. Only four in. of the housing show above the deckline. These changes reportedly provide better protection for the hydraulic unit from damage from branches and other obstructions. When equipped with a single valve, the 165 provides control for the ripper only. Use of a double valve permits operation of the ripper and the hydraulic tilt cylinder.

A MULTI-PURPOSE PRE-FABRICATED STEEL BUILDING, the Spartan, has been developed by Martin Steel Corp., Mansfield, Ohio. As a functional structure for the mining industry, it can be used in such ways as an office, bunk-house, commissary, or for equipment storage. Fireproof and rust-resistant, it is available in a wide array of sizes. The Spartan is planned to conform to most building codes and is available in widths of 12 ft multiples for erecting buildings up to

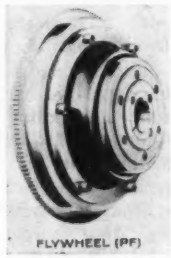


72 ft wide. Lengths start at 32 ft, coming in multiples of 16 ft to give any desired length. There are three basic heights: 10, 12, and 14 ft.

TWO CUSHION-TYPE COUPLINGS being introduced for high speed or high torque applications by Dodge Mfg. Corp., Mishawaka, Ind., utilize a pan-shaped rubber flexing



HIGH SPEED (PH)

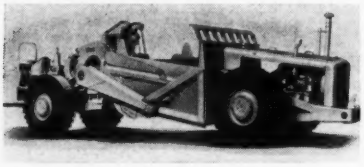


FLYWHEEL (PF)

element. These couplings are identified by Dodge as Para-flex High Speed and Para-flex Flywheel types, and were designed to operate at higher speeds and to transmit greater torque than the original Standard Para-flex. The new types are recommended to accommodate, either singly or in any combination, angular and parallel shaft misalignment and end float, to absorb torsional vibration, and to cushion shock loads. The High Speed coupling consists of the flexible member supported on one side by a clamp-ring flange, with its larger side bolted to a steel disc, while the Flywheel coupling is like the High Speed except that its larger side bolts directly to the flywheel of an internal combustion engine instead of being supported by a taper-bushed steel disc. Both couplings are now offered in sizes to deliver up to 47 hp per 100 rpm and with Taper-Lock bushings to fit shafts up to four in. in diam.

A CORROSION-INHIBITING COMPOUND reportedly prevents coal, ore, aggregate and similar materials from freezing while in transit or in storage. It is being marketed under the name Hardy Frez-Pruf Compound by Hardy Salt Co., P. O. Drawer 449, St. Louis 66, Mo. The compound contains a phosphate additive which adheres to metal surfaces to provide protection against oxidation and electro-chemical corrosion. Formulations for either dry or liquid application are available.

A TWIN-POWER SCRAPER of 14 cu yd struck capacity and 20 yd heaped S.A.E. rating at 1:1 slope has been announced by Euclid Division, General Motors Corp., Cleveland 17,



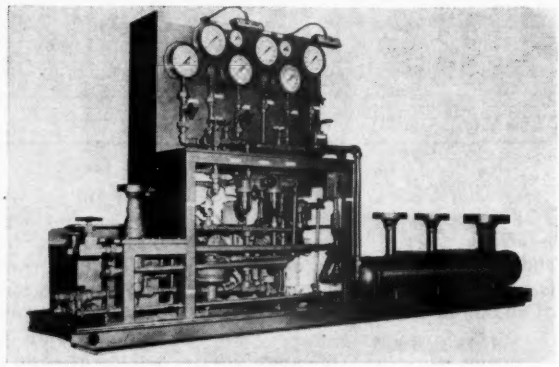
Ohio. Designated as Model TS-14, this all-wheel drive scraper is powered by two GM 4-71 engines, each with a separate Allison Torqmatic Drive consisting of torque converter and four-speed semi-automatic transmission. Two hydraulic jacks provide full 90° steering. All scraper operations—bowl, apron, and ejector—are hydraulically and independently controlled. The ejector is of the positive roll out type actuated by a hydraulic jack that is identical to the apron jack. Two inter-changeable bowl jacks are connected to the scraper bowl through heavy duty levers and linkage. Cutting edge consists of four sections that are identical and reversible—each section is adjustable to provide the most efficient loading in any material.

A ROLLER FLANGE FLAME HARDENER, designed to increase the hardness of rebuilt tractor rollers and so prevent flange roll-over, has been announced by Victor Equipment Co., 884 Folsom St., San Francisco 7, Calif. This machine flame hardens the re-



newed area to approximately 50 Rockwell C., and dual torches enable the machine to flame harden both the inside and outside of the rebuilt roller simultaneously, thus preventing distortion.

A UNIVERSAL VALVE TEST STAND—the Series B of Farris Engineering Corp., 587 Commercial Ave., Palisades Park, N. J.—will test all valves including globe, gate, plug cocks, safety and relief plus other hydraulic-pneumatic equipment. Valve inventory can reportedly be reduced to a minimum by using this equipment to reset valves to use them in the widest possible variety of applications and pressure variations.

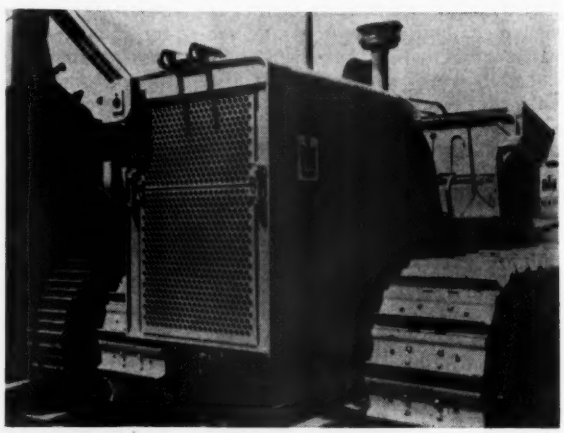


The test stand's built-in compressor provides a useful source of compressed air for general plant service. All controls are within reach on one panel with simple instructions printed on metal plate. Compact (10½ ft by 3 ft), its wide range permits testing of pressure settings up to 2000 psi for air and 6000 psi for water.

A PRE-MIXED BLASTING AGENT for use in mining, quarrying, construction and petroleum exploration has been announced by E. I. DuPont De Nemours and Co., Wilmington 99, Del. Nilite 101 nitro-carbo-nitrate blasting agent, usable in holes as small as two in. in diam, is now available in 50-lb bags for delivery throughout the country. Free flow and greater assurance of uniformity in blasting are claimed advantages. The product is also said to improve performance of delay blasting systems. It is not cap sensitive and requires a primer to detonate it.

SMALL LIGHTWEIGHT PORTABLE TV CAMERAS for industrial use at low light levels have been announced by Dage Television Div., Thompson Ramo Wooldridge Inc., Michigan City, Ind. Called the Dage Model 81 Industrial IO Camera, it is said to solve, through the use of an Image Orthicon camera tube, the problem of television monitoring at light levels which render Vidicon cameras useless, and through complete transistorization, provides a lightweight 800-line resolution camera. The camera control provides either industrial or EIA sync to meet varied customers' needs.

A ONE PIECE, WRAP-AROUND RADIATOR GUARD that affords increased protection to the radiator core, front-mounted pumps and cable controls has been announced by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., as available for its TD-20 and TD-15 crawler tractors. Heavy-duty outside plate, formed from ⅝-in. steel plate, reportedly adds strength to the front of the tractor and conforms with the current styling



trend of the International line. A swing-out, access door permits easy cleaning of the radiator core and an improved dowelling arrangement makes for ease of assembly. The guards are also said to offer an improved hydraulic tank and pump-mounting arrangement on tractors equipped with hydraulic blades.

—ANNOUNCEMENTS—

H. B. Stafford and **C. M. Waugaman** have been named to new positions in the headquarters operations of **Mine Safety Appliances Co.**



H. B. Stafford



C. M. Waugaman

Stafford has been appointed director of the company's newly created cost appraisal program, retaining at the same time direction of the research and engineering activities of the Technical Products division. He has been with MSA since 1934. Waugaman, who first joined the company in 1943 with the research department, has been promoted from superintendant of production control to manager of materials control.

David J. Davis has been elected vice president of sales and advertising of **Gar Wood Industries, Inc.,** Wayne, Mich., by the company's board of directors. Davis has been with the company since it was merged with the **Buckeye Traction Ditcher Co.** of Findlay, Ohio. He has had long experience in sales of construction machinery and truck equipment.

John R. Greenly has been named manager of **Lake Shore Steel Warehouse division** of **Lake Shore, Inc.,** Iron Mountain, Mich. Greenly, who will also continue as manager of the company's Supply and Service division, will spearhead Lake Shore's new expanded program of steel service and supply operations in the Michigan Upper Peninsula and Wisconsin areas.



J. J. Orr has been named director of engineering, **United States Rubber Co.** Orr succeeds **Carl A. Ostling** who is retiring after 22 years of srevice with the company. Orr joined the rubber company as an electrical engineer in New York in 1931, and after several promotions was made assistant director of engineering in 1956.

Robert J. Collier has been appointed sales promotion manager for **Atlas Copco** companies in the United States. Atlas Copço sales in the U. S. are through **Atlas Copco Eastern,** Paramus, N. J.; **Atlas Copco Pacific,** San Carlos, Calif. and district offices across the country.

H. K. Porter Co., Inc., National Electric Div., Pittsburgh, announces the appointment of **Edward McVickar** as manager of mining and welding cable sales.

In new service promotion moves announced by the **Crusher and Process Machinery Div., Nordberg Mfg. Co.,** Milwaukee, Wis.,



E. T. Daum



W. R. N. Currie

Eugene T. Daum has been appointed as sales engineer in the new office in Dallas, Texas, from which he will cover the states of Texas, Oklahoma, New Mexico, Colorado, and part of western Kansas. **W. R. Neil Currie** has been assigned to the St. Louis office as sales engineer. He had past service in the mining industry, having earned underground experience with both Algoma and Homestake.

R. R. Spencer, formerly project engineer with **Calumet and Hecla, Inc.,** is moving to Hibbing, Minn., to become manager of **Langer Equipment Co.** Langer is now a wholly owned subsidiary of the **W. B. Thompson Co.** of Iron Mountain, Mich.

Robert D. Greer was recently appointed apparatus sales engineer for the **Mining Division, Jeffrey Manufacturing Co.** At the same time **Paul R. Williams** became assistant service manager of the Mining Division.

CATALOGS & BULLETINS

TEMPERATURE REGULATOR. *OPW-Jordan, 6013 Wiche Rd., Cincinnati, 13, Onio.* Catalog J180-1 contains full information on the complete line of Sliding Gate and Plate Temperature Regulators available from OPW-Jordan. Designed for use on steam, water, air, oil, gas or chemicals, Sliding Gate Temperature Regulators control temperatures from 35° F to 450° F, at pressures up to 250 psig.

MOTORIZED PULLEYS. *Western Conveyor Co., P. O. Box 357, Boise, Idaho.* The Schrock Motorized Pulley Selection Catalog gives specifications and dimensions for the "latest" models of the company's motorized pulleys from 1 to 75 hp and with face widths from 22 to 57 in. Also included are installation diagrams and descriptions of available accessories and modifications for specialized conveyor drive installations, and a section of four charts for determination of the proper pulley for a specific installation.

TRACTOR TREAD LOADERS. *Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago 9, Ill.* Catalog G-145 describes the Goodman 960 series loaders, a-c or d-c, for loading coal, gypsum and potash.

AUTOMATIC SAMPLER. *Hardinge Co., Inc., 240 Arch St., York, Pa.* Bulletin 47-A describes in detail the new operating mechanism of Hardinge's "re-designed" automatic sampler and includes typical arrangements for both wet and dry processes. The sampler takes periodic "cuts" from a stream of moving material, either wet or dry, at any stage in a continuous flow process. It is particularly adapted to the mining, stone products, ceramics, chemical and allied process industries.

PNEUMATIC CONVEYING AND TACONITE PROCESSING. *Fuller Co., Catasauqua, Pa.* Fuller Fact File ER-33-1 tells how the largest taconite pelletizing plant on the Mesabi range in Minnesota employs pneumatic conveying to solve handling problems. Specifically reported on is the handling of fine crushed coal and two troublesome additives, bentonite and soda ash. Also shown is the way four separate pneumatic conveying systems, as well as their components, are controlled by a single huge panel.

MINE TECHNIQUES AND OPERATIONS. *Advertising Div., Caterpillar Tractor Co., Peoria, Ill.* Entitled "Successful Mining," Form No. DE009 describes modern mine techniques in various parts of the world. Special attention is given to the use of crawler-mounted rippers to loosen deposits and overburden and the techniques of seismic analysis to determine rippability of materials.

SEPARATION EQUIPMENT. *The Eimco Corp., P. O. Box 300, Salt Lake City 10, Utah.* Catalog FP-1003 describes the company's complete line of liquid-solids separation equipment for chemical and metallurgical processing. It includes pictures and brief descriptions of all Eimco equipment for vacuum and pressure filtration, for sedimentation and flotation clarification and water and trade wastes treatment equipment.

(Continued next page)

(*continued from previous page*)

FIRE HOSE. *The Fyr-Fyter Co., Customer Services Dept., 221 Crane St., Dayton 1, Ohio.* Bulletin No. S-230 contains complete feature and specification data on approximately 12 different styles of fire hose furnished by this company for the protection of mines, industrial plants and other commercial and public buildings.

ALARM CONTROL SYSTEM. *General Electric Communication Products Dept., P. O. Box 4197, Lynchburg, Va.* Bulletin ECM 119 covers a high-capacity alarm/control system that reportedly provides an inexpensive method of locating faults at unattended remote operations and controls "on-off" functions remotely. The publication describes how the user may "customize" the equipment to meet a variety of specific supervisory or control needs. A basic system consists of a Master Interrogator unit and from one to ten Remote Responders. A pulsed tone is transmitted through the network and returned, giving positive indication of alarm or control functions.

BRAKE BLOCKS. *The S. K. Wellman Co., 200 Egbert Rd., Bedford, Ohio.* Bulletin L-1392A describes the company's Velvetouch Feramic Brake Blocks, produced primarily for trucks, tractors, trailers, construction and off-highway industrial equipment. The blocks are made of sintered iron powders fused directly to solid steel backing plates. Forward and reverse blocks have identical friction material, which simplifies stocking and installation.

DUST COLLECTORS. *American-Standard Industrial Div., Detroit 32, Mich.* The Series 345 dust collector line is described in bulletin No. 1928. Design and construction principles are discussed and the advantages of large tubes for high efficiencies and resistance to plugging are outlined. Highlight of the bulletin is a pair of nomograms, one for collector selection, the other for efficiency determination. Simple directions for using the nomograms are presented as related to an example problem. The recommended step-by-step procedure for collector selection and efficiency determination using the nomograms is given in terms of the example problem.

HEAVY-GAUGE PERFORATED METAL. *Cross Perforated Metals, National-Standard Co., Niles, Mich.* Engineering data for complete specification of heavy-gauge perforated metal is outlined in brochure No. 8159. The data covers applications of perforated metal as screens, strainers, dryers, separators, supports, guards, ventilators and drains for mining, quarrying and numerous other industries. Included are directions for pattern specification, dimensions, unit weights, calculation of open area, materials selection, fastening methods, and equivalence tables relating wire cloth to square, round and Cross Hexcreen patterns.

SPEED VARIATOR. *General Electric Co., Schenectady 5, N. Y.* Detailed information on GE's Thymotrol Speed Variator, which uses Thyatron tubes to convert a-c to d-c power, is contained in a new bulletin GEA-7019. Described is the adaptability of the Thymotrol drive to machine feed and spindle applications, reeling equipment, conveyor systems, processing equipment, and any other application where precise speed control is essential. Also included is illustrated information on the standard features as well as the modifications which provide a Speed Variator that is tailored to the user's specific needs.

METERS, FEEDERS, CONTROLS. *B-I-F Industries, Inc., P. O. Box 1342, Providence 1, R. I.* Bulletin No. 0001.20-1 provides capsule information about many of the company's systems and products including Butterfly valves, supervisory control systems, totalizing meters, water and waste treatment equipment & systems, flow meters, process instrumentation, feeders for solids and liquids and blenders for liquids.

TRACTOR SHOVELS. *Construction Machinery Div., Clark Equipment Co., Pipestone Plant, Benton Harbor, Mich.* CMD Bulletin TS2500 describes the two largest capacity "Michigan" tractor shovels —Models 275A and 375A. The 262-hp model 275A is equipped with a 4½-yd bucket and the 335-hp model 375A with a six-yd bucket.

SILICON RECTIFIER PACKAGES. *Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.* Entitled "Power Savings for the Electrochemical Industry with Westinghouse Silicon Rectifiers," booklet B-7900 presents a detailed description of a silicon power package and states the advantages of silicon over other rectifying methods.

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